

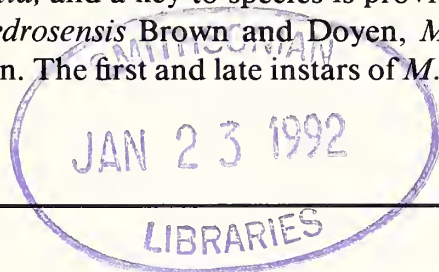
REVIEW OF THE GENUS *MICROSCHATIA* (SOLIER) (TENEBRIONIDAE: COLEOPTERA)

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Abstract.—Taxonomic relationships are detailed for 12 species in the genus *Microschatia*, which is distributed from north central Mexico and Baja California to southern Texas, New Mexico, Arizona and California, in arid or subarid habitats. *Pycnonotida* Casey and *Acroschatia* Wilke are treated as junior synonyms of *Microschatia*, and a key to species is provided. Newly described are *M. solieri* Brown and Doyen, *M. cedrosensis* Brown and Doyen, *M. costulata* Brown and Doyen and *M. planata* Doyen and Brown. The first and late instars of *M. championi* are characterized.



Microschatia constitutes a small genus of poorly studied beetles of the tribe Asidini. The genus was proposed by Solier (1836) for his species *punctata*. Horn (1893) briefly described the seven species then known and provided a key. It is worth remarking that *Microschatia* is sufficiently distinct that its species were never included in the catchall genus *Asida*, which contained most American Asidini before being split by Casey (1912) into numerous new genera. Most of Casey's asidine genera appear to be valid and are presently recognized in catalogs. However, his genus *Pycnonotida*, proposed to contain *M. inaequalis* LeConte, is here placed in synonymy under *Microschatia* for reasons discussed below. Likewise, *Acroschatia*, proposed by Wilke (1922) for *M. robusta*, is here considered unjustified and placed in synonymy.

We have examined types of all described species except *M. punctata* Solier, of which the identity is clear from Solier's description and illustration. The intent of the present account is to describe four additional species, redefine *Microschatia*, and to provide an estimate of its cladistic structure and a key to the species.

MATERIALS AND METHODS

Specimens were measured with dial calipers (M.P.J. Gauge and Tool Co., Ltd., England) or with an ocular micrometer. Female internal structures were prepared as described by Tschinkel and Doyen (1980), but stored in glycerine on depression slides. Cladistic analyses were performed using Hennig 86 (J. S. Farris, S.U.N.Y.). Larval rearing was accomplished using containers and procedures described by Brown (1973) and Doyen (1973).

BIOLOGY

With three exceptions, *Microschatia* have remained rare beetles in collections. The exceptional species are *M. championi*, which is locally abundant about palm oases

in Baja California Norte, *M. planata*, which seasonally is extremely abundant on sand dunes in the Vizcaino region of Baja California, and *M. inaequalis* which was formerly common in much of coastal California south of the Los Angeles Basin. The first species is now represented by about 85 specimens, nearly all collected from the area around Arroyo Catavina. *Microschatia planata*, which was first collected in 1973, now numbers more than 200 museum specimens, nearly all from the vicinity of Guerrero Negro. Most recently collected specimens of *M. inaequalis* are from interior locations near Riverside, Riverside County. However, as recently as 30 years ago significant series were collected in coastal localities in Orange and San Diego Counties. Apparently many of these coastal populations have been eliminated by suburban expansion.

In large part because of their rarity in collections, most species of *Microschatia* have very poorly known life histories. Collection dates indicate that the species inhabiting the central plateau of Mexico are active during the high rainfall months of June to September. In contrast, the Pacific coastal species are active primarily during the period from January to June, corresponding to the precipitation pattern of that region. This shift in time of activity occurs in several other Pacific coastal Tenebrionidae, including *Stenomorpha*, *Trichiasida* (Asidini) and some *Eusattus* (Coniontini).

Most Asidini are relatively short lived as adults, often surviving only a few weeks. No records exist for any of the mainland Mexican species, but *M. inaequalis* and *championi* survive several months in the laboratory, and some individuals of *M. planata* have survived for over six months (J.T.D., unpublished).

Several of the species of *Microschatia* inhabiting the central plateau of Mexico thickly encrust parts of the body with fine particles of soil, whereas those of the Pacific coast have clean cuticle. The function of encrusting, which probably begins in the teneral adult in the pupal chamber, is probably camouflage, since the encrusted surfaces are rendered similar in color to the substrate (see also Lawrence and Hlavac, 1979). The patterns formed by the encrusting material are somewhat taxon specific. For example, in *M. punctata*, *solieri* and *robusta* portions of the dorsum and femora are covered, whereas in *M. morata*, *rockefelleri* and *sulcipennis* only the dorsum of some individuals has a light coating of soil. Details of the encrustation patterns appear in the descriptions of pertinent species.

Unlike the taxa discussed by Lawrence and Hlavac the cuticular surface of *Microschatia* species is not organized as a complex system of pores and canals for distribution of adhesive secretions. Rather, the encrusted material is localized in cuticular depressions (either punctures or rugosity), but the source of the adhesive and means of its distribution are not apparent.

Encrusting is frequently accompanied by presence of scale-like setae in Coleoptera (e.g., Zopheridae; Colydiidae; Derodontidae) (Lawrence and Hlavac, 1979), and all encrusting species of *Microschatia* have flattened setae, though not always corresponding to the areas of encrustation. In several species the scaliform setae form striking, unique patterns, which do not obviously contribute to camouflage.

The mainland Mexican species of *Microschatia* mostly occupy semiarid woodland habitats, judging from collection records, but no details of habitat preference or requirements are available. Among the Pacific coastal species, *M. inaequalis* has been collected in many different situations, including maritime bluffs, and on both stoney

and fine grained substrates in the interior of southern California. Plant formations occupied include coastal and interior chaparral, savannah woodland and desert. In contrast, *M. championi* and *M. planata* appear to be much more restricted. The former has been collected almost exclusively around areas with permanent subsurface water, especially palm oases. The latter is narrowly restricted to aeolean sand dunes in the Vizcaino region of Baja California.

Larvae have been positively associated only with *M. championi*. They hatched from eggs deposited by captive females and survived in the laboratory to moderate size, but then failed to continue growing, all eventually dying before pupation. Nothing is known of larval biology under natural conditions.

CLADISTIC RELATIONSHIPS

Estimates of cladistic relationships were based on analysis of the 32 characters listed in Appendix 1. Since *Microschatia* is morphologically isolated in the Asidini, making it very difficult to convincingly designate a sister genus, characters were polarized according to their general distribution in Asidini, delimiting a hypothetical outgroup [defined by primitive states for all characters]. For nearly all the characters it seems clear which state is primitive for Asidini, but it is also apparent that convergence or parallelism has been commonplace in these beetles. For example, while a basally constricted pronotum may be reasonably construed as primitive in Asidini, parallel sided bodies occur in *Asidopsis*, *Parasida* and *Litasida*, as well as *Microschatia*. Within *Microschatia*, therefore, it is possible that the parallel sided condition is primitive and the waisted condition a secondary reversal, or that parallel sidedness has evolved more than once. An overall assessment of generic relationships within Asidini is in progress (KWB), and may eventually require modifying some of the character polarizations applied here by allowing identification of a real sister taxon to *Microschatia*.

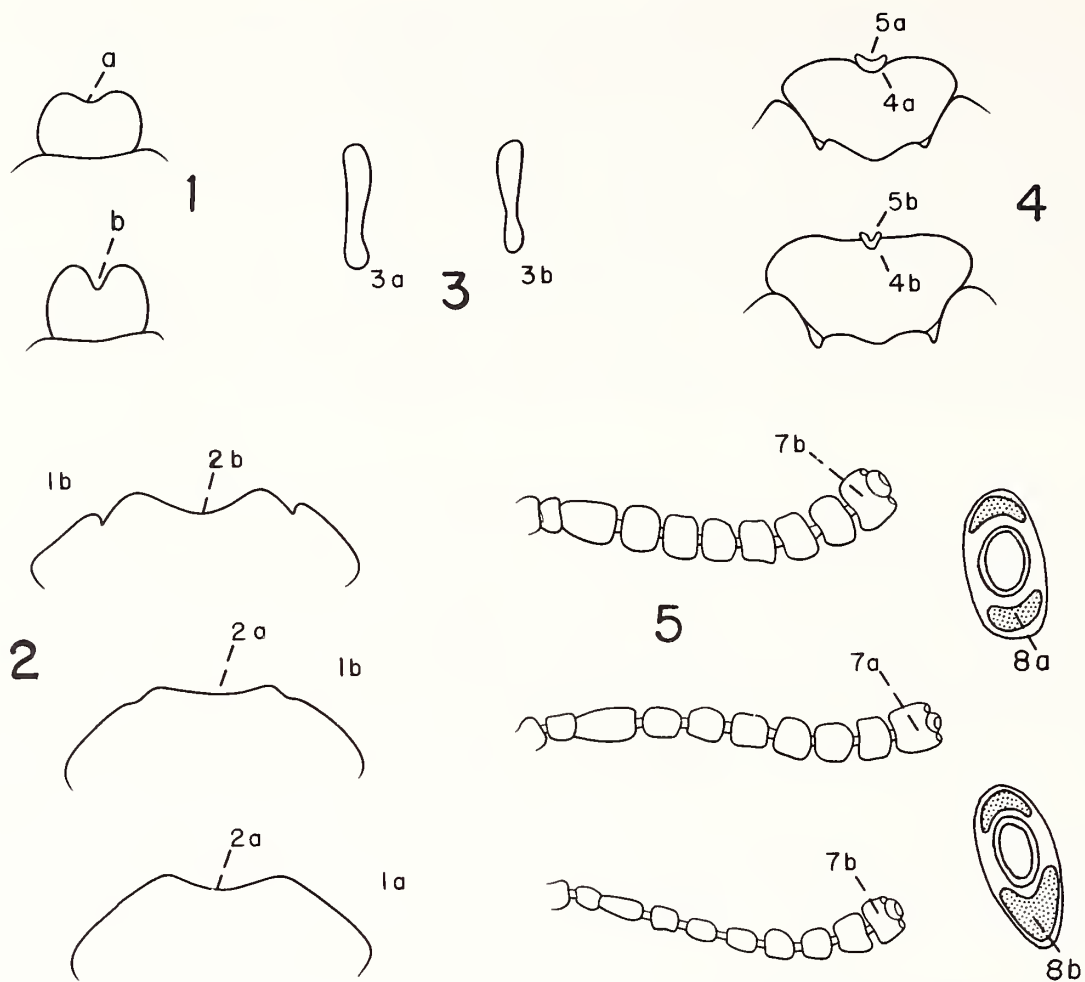
Characters and States

0. *Labrum shape* (Fig. 1). In most Tenebrionidae the anterior margin of the labrum is arcuately convex or truncate. In Asidini it is commonly concave, but not so deeply and narrowly as in *Microschatia*. In many genera dense brushes of anteromedially directed labral setae give the impression of a deep, narrow emargination.

1–2. *Epistomal shape* (Fig. 2). A medially truncate or arcuate anterior margin with the lateral epistomal sutures often obsolete and faintly indicated by indentations is general in Tenebrionidae and apparently primitive in Asidini. The lateral sutures are marked by strong indentations in *Ucalegon*, some *Stenomorpha*, *Platasida* and *Bothrasida*, as well as *Microschatia*. The epistoma is deeply concave in *Tisamenes* and moderately so in several other genera.

3. *Eye shape* (Fig. 3). Eyes of Tenebrionidae are characteristically deeply emarginated by the epistomal canthus. In *Microschatia* the eyes are very elongate and the degree of constriction is reduced. This appears to be the primitive condition in Asidini, and in most other genera the eyes are elongate or short oval, without trace of constriction.

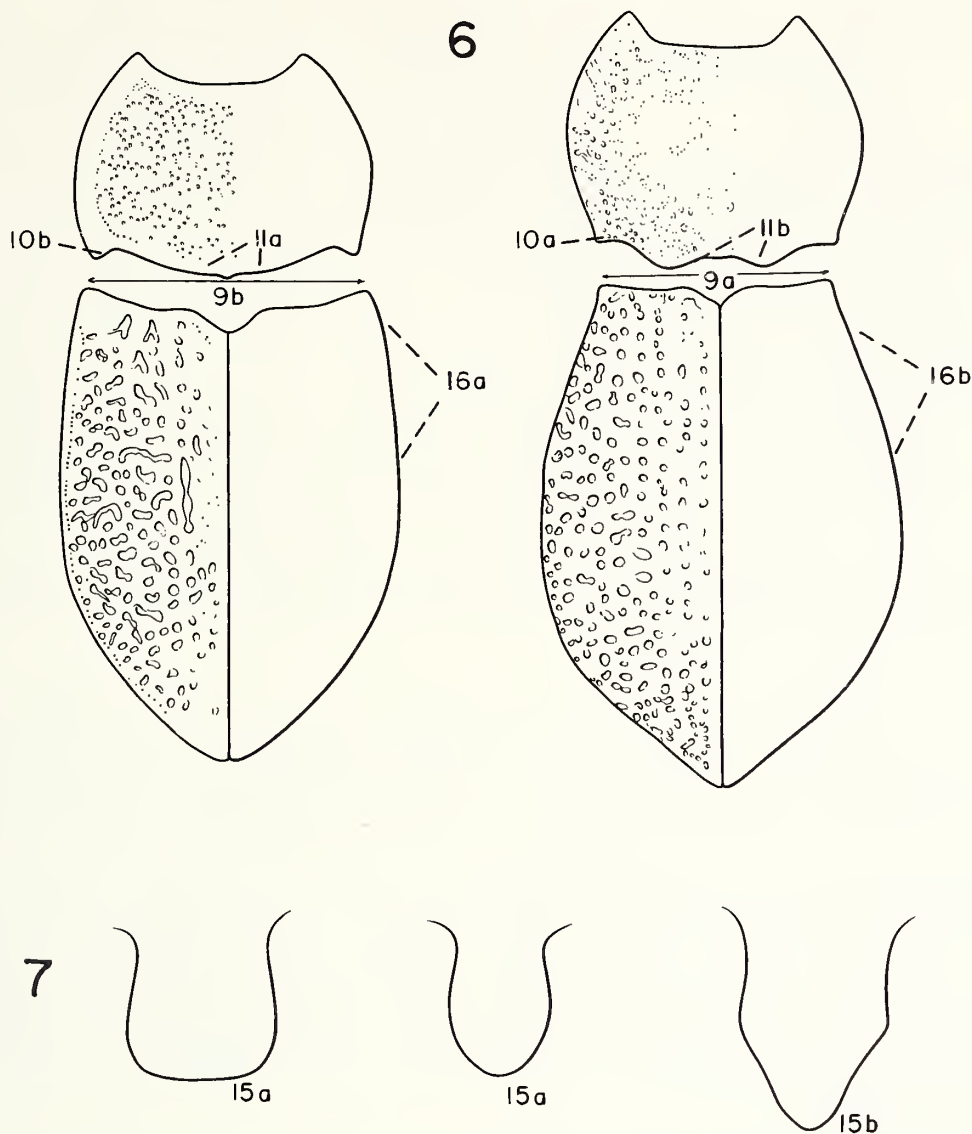
4–5. *Mentum and ligula* (Fig. 4). The small size of the ligula and its high degree of sclerotization appear to be apomorphies for Asidini. The ligula is also sclerotized



Figs. 1–5. Taxonomic characters of *Microschatia*. 1. Labra of *inaequalis* (a), *rockefelleri* (b). 2. Epistomal margins of *solieri* (top), *rockefelleri* (middle) and *inaequalis* (bottom). 3. Eye shape of *championi* (left) and *solieri* (right). 4. Labia of *rockefelleri* (top) and *solieri* (bottom). 5. Antennae of *solieri* (top), *rockefelleri* (middle) and *inaequalis* (bottom). Small numbers and letters indicate characters and character states as listed in Appendix 1.

(less strongly so) in Coniointini, but is much larger relative to the mentum. In most Tenebrionidae the mentum is broadly emarginate, with the ligula exposed in the emargination. In most Asidini there is a narrow notch in the middle of the emargination. The notch becomes especially deep in some *Microschatia*, and the ligula is retracted beneath the mentum and barely visible. The ligula is also largely concealed in the asidine genera *Stenosides* and *Astrotus*.

6–8. *Antennal configuration* (Fig. 5). Antennae are typically short in Asidini, as they are in *Stenosides* and *Astrotus*, which are similar to *Microschatia* in a few other features. Therefore we consider the longer antennae in some *Microschatia* to be derived. The antennae of *Microschatia* are also somewhat longer in males than in females. Antennal segment 10 in Tenebrionidae (including Asidini) is usually longer than wide or subquadrate. Thus, the relatively broad segments of *Microschatia* are considered derived. However, this feature is subject to much homoplasy throughout the family. The tomentose sensory patches on segment 10 are usually subequal in size, which we consider plesiomorphic. In some *Microschatia* the outer patch is enlarged as in *Gonasida*, *Philolithus*, *Trichiasida*, and *Tisamenes*. In *Gonasida*, *Philolithus* and *Trichiasida* the inner patch is split into two smaller ones. In *Sicharbas*,



Figs. 6, 7. Taxonomic characters of *Microschatia*. 6. Dorsa of *rockefelleri* (left) and *championi* (right). 7. Prosternal processes of *solieri* (left), *inaequalis* (middle) and *planata* (right). Conventions as in Figures 1–5.

Platasida and *Heterasida* the tomentose patches are consolidated into a ring. Generally the disposition of these tomentose patches appears to be a useful character for Asidini.

9–12. *Pronotal configuration* (Fig. 6). As discussed above, basally constricted pronota are regarded as plesiomorphic in Asidini, but homoplasy is common. Similarly, obtuse basal angles appear to be plesiomorphic. Acute basal angles are usually produced posteriorly or laterally, conditions which are also derived. Again, homoplasy is expected. The bisinuate or biangulate pronotum with posterior gibbae is restricted to the *inaequalis* species group of *Microschatia*, which occurs in Baja California and extreme southern California. The function of the bigibbous prothorax is unknown, but a similar configuration occurs in *Stenomorpha tumidicollis* Blaisdell and *Trichiasida gibbicollis* (Horn), which also inhabit Baja California.

13. *Relative width of elytral base* (Fig. 6). Typically in Tenebrionidae the prothoracic and elytral bases are subequal. When the elytral base is notably narrower, the basal pronotal angles are often produced. Homoplasy may be expected in this feature.

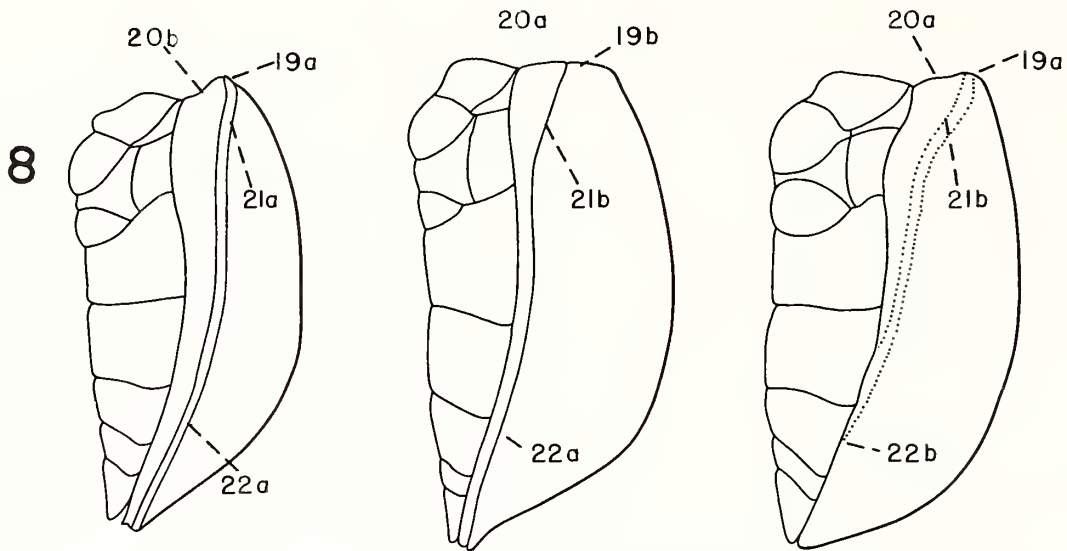


Fig. 8. Taxonomic characters of elytra and epipleura of *Microschatia rockefelleri* (left), *championi* (middle) and *solieri* right. Conventions as in Figures 1–5.

14. *Hypomeron sculpture*. This feature varies from smooth through punctate to tuberculate in Asidini and within *Microschatia*, making polarization problematic. Reversal of polarity of this character does not change the topology of the cladogram, however.

15. *Prosternal process*. In Asidini this structure is characteristically declivous immediately behind the procoxae and apically truncate or broadly rounded. In *Litasida* and *Bothrasida* it is porrect and broadly rounded, and in *Ucalegon*, porrect and sagittate (Fig. 7). The subhorizontal process of *Microschatia* is probably derived independently of the conditions described above. The sagittate condition is almost certainly apomorphic.

16. *Elytral shape*. See 9, above.

17–18. *Elytral sculpture*. Polarization is problematic. These characters have relatively low consistency indices and received the lowest assigned weights with successive weighting.

19–22. *Epipleural configuration* (Fig. 8). Typically in Tenebrionidae the epipleural carina is complete from the elytral humerus to the apex or nearly so, and subparallel with the elytral margin. In most Asidini the epipleural carina is visible only near the elytral apex and sometimes near the humerus. This apomorphic condition occurs in *Microschatia punctata*, *solieri* and *robusta*. In *M. rockefelleri*, *sulcipennis* and *morata* the epipleuron is very broad at the humerus, narrowing rapidly to about the level of the metacoxa, then narrowing gradually to the elytral apex. In all of these species the humeral angles are apomorphic in projecting forward and are slightly acute when viewed from below.

23–26. *Body setation and coating*. A large majority of Tenebrionidae, including most Asidini, have clean cuticle, without a coating of earth or detritus. Many Asidini, however, apparently secrete a material which cements fine particulate material to the body, often in characteristic patterns. Encrusting is an apomorphic feature which appears to have been derived many times in Asidini.

In addition to cuticular encrustations, some species of *Microschatia* have the typical hairlike setae apomorphically modified by slight to extreme flattening. The scaliform

setae may be evenly distributed or, in the apomorphic state, concentrated in particular areas on the head, thorax or elytra. White, slightly flattened setae on the legs are apomorphic to *punctata*, *solieri* and *robusta*.

27–31. These characters are all synapomorphies for *Microschatia*. Somewhat thickened tarsi occur in a few other genera (*Gonasida*, *Tisamenes*), but these are very different from *Microschatia* in other features, suggesting convergence. A very large mentum occurs in several other genera (*Sicharbas*, *Astrotus*, *Stenosides*), but these lack nearly all the other synapomorphies characterizing *Microschatia* and do not appear to be very closely related. The apical antennal segment is always reduced in Asidini, but only in *Sicharbas* and *Litasida* is the degree of reduction comparable to that in *Microschatia*. In *Sicharbas* the tenth segment is much enlarged with coalesced patches of tomentum. The very small eleventh segment is not amplexed into a notch, as in *Microschatia*. These differences suggest independent reduction. The antennal apex of *Litasida* is essentially the same as that of *Microschatia*.

Results

A single most parsimonious tree of 48 steps (Fig. 9) was produced by HENNIG 86. The two main branches of the tree correspond to the *punctata* and *inaequalis* species groups (see below), which inhabit mainland Mexico and Baja California, respectively. The *punctata* species group and its two subgroups are each distinguished by at least six apomorphies (at least two of these unique). In contrast the *inaequalis* species group is distinguished by only two unique apomorphies and its subgroups by no more than one. The arrangement in Figure 9 conforms to our intuitive placement of taxa, except that *M. polita* is separated from *inaequalis*, which it resembles in general body shape. However, two derived features of cuticular sculpturing that are shared by *inaequalis*, *cedrosensis* and *costulata* are plesiomorphic in *polita* (characters 14, 17). The derived, sagittate prosternal process (character 15) is present in all members of the *inaequalis* group except *polita*.

Most of the homoplasy in Figure 9 is due to convergence, but two characters (no. 4 and 17) are each reversed once and two (18 and 21) are derived more than twice. These characters have a consistency index (Farris, 1989) of 0.33 and were given minimal weights (1 to 3) in successive weighting analyses. Characters 6, 7, 9, 10, 11, 13, 14, and 16 are each derived twice in Figure 9 (weights of 4). All the others are uniquely derived and given full weights of 10. The tree resulting from successive weighting is topologically identical to Figure 9, but the consistency index is 0.86 and the tree length is 267.

The cladistic structure in Figure 9 shows an obvious biogeographic pattern. The *punctata* species group inhabits the plateau of north central Mexico and adjoining southwestern United States. The *inaequalis* group species all occur in central to northern Baja California, with two species barely entering extreme southern California or Arizona and one (*polita*) apparently restricted to Arizona. Vicariance across the gulf of California also occurs in Coniontini (*Eusattus*) (Doyen, 1984), Triorophini (*Triphalopsis*: *Triphalopsoides*) (Doyen, 1990) and will probably be revealed by cladistic analyses in other Tenebrionidae such as *Argoporis* and *Eleodes*. Distributions of the individual species of *Microschatia* are inadequately known to reveal additional vicariance patterns.

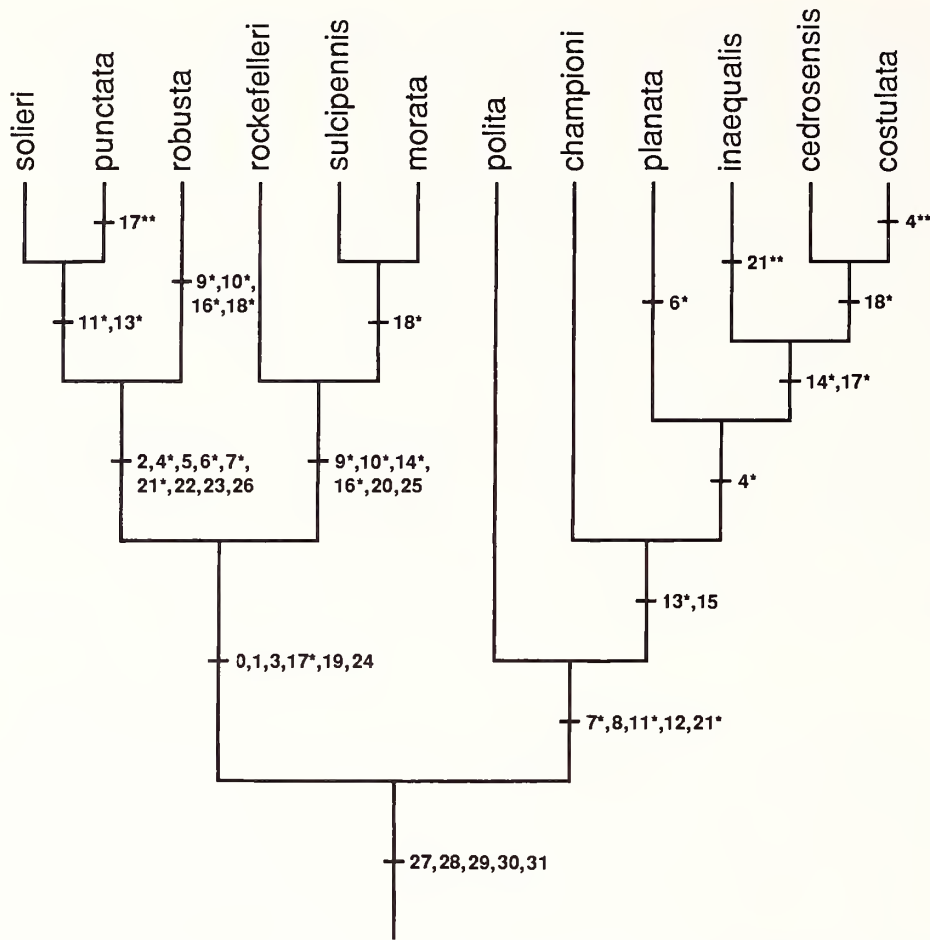


Fig. 9. Cladogram for species of *Microschatia*. Apomorphies are listed by character number for each branch. Single asterisks indicate character state convergences; double asterisks indicate reversals. Autapomorphies (other than reversals) are not shown. Characters and character states are described in Appendix 1 and discussed in the text. C.I. = 0.86.

Microschatia Solier

Microschatia Solier, 1836:474.

Pycnonotida Casey, 1912:89. NEW SYNONYMY.

Acroschatia Wilke, 1922:269. NEW SYNONYMY.

Description. Adult.—Strongly convex to somewhat flattened, robust beetles, often with flattened, scale-like setae on the dorsum.

Mentum transversely hexagonal to broadly cordate, closely contacting postgenal processes, exposing minute to moderate space at corners (Fig. 4); anterior border broadly emarginate, often with narrow, median notch. Gular pedestal broadly emarginate, almost as wide as base of mentum. Postgenal process extending to about basal third of mentum, apex broadly rounded. Ligula small, barely visible, rarely extending beyond emargination in mentum. Maxillary palps with apical segment isosceles or rectitriangular, similar in male and female. Labrum deeply, narrowly notched, broadly emarginate or entire; epistomum with anterior border arcuately emarginate. Eye very elongate oval or very weakly reniform, concealed when head is retracted; dorsal lobe slightly larger than ventral. Pronotum with lateral borders nearly evenly arcuate, flat or nearly so with margin sometimes thickened; base arcuate to bisinuate or biangulate, sometimes with paramedian basal gibbositities; posterior angles obtuse,

not overlapping elytral humeri to acute, projecting backward over humeri. Prosternal process broad, projecting posterad a short to moderate distance behind coxae, then abruptly declivous; apex subtruncate to sagittate, received in shallow to moderate mesosternal fossa. Elytra with variable sculpture; epipleuron broad and distinct at humerus, complete or becoming undefined at about first abdominal sternite. Anterior tibia cylindrical or flattened, with distinct spatulate or digitate process on outer apical angle; tibial spurs subequal or anterior spurs much larger than posterior. Tarsi thick, with short, stout spiniform setae beneath. Female reproductive tract typical of Asidini, with enlarged vagina, short, multiply-branched spermathecal tubes and long, distally enlarged spermathecal accessory gland (Figs. 10–11). Ovipositor with coxites straight or very weakly upcurved, about one-fourth length of paraprocts. Aedeagus with basal piece of tegmen about three-fourths to one times as long as paramere; paramere with apex acutely attenuate.

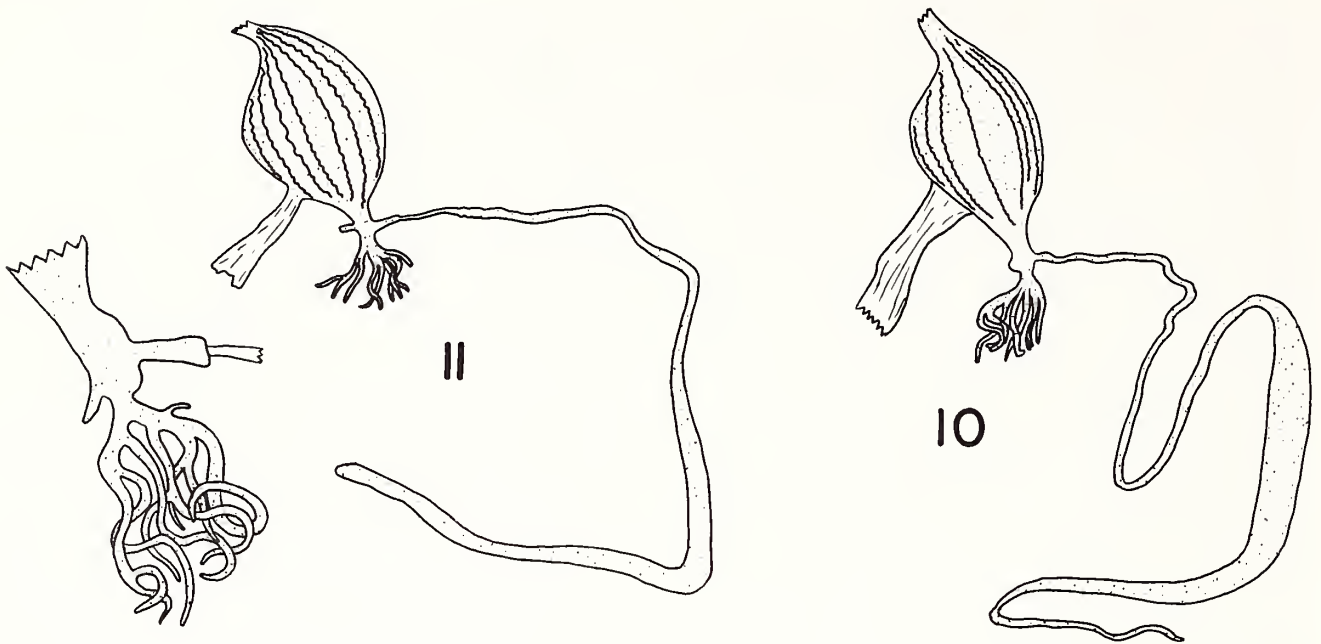
Late instar (Figs. 19–27).—Conforming to description of Asidini by Brown (1973) except for following features. Epicranial stem about one-third length of cranium; lateral epicranial sutures very short. Cranium with at least anterior one-third of dorsum covered by extremely short globular setae, appearing granular; genae densely covered with stout setae, these becoming longer, more slender ventrally. Clypeus with globular setae nearly contiguous in posterior half, glabrous anteriorly.

Prothorax with anterior and posterior borders lightly pigmented, granulate or not; mesothorax and metathorax subequal. Abdominal segments one to eight with anterior transverse band of setae; spiracles located about one-fourth to one-sixth distance from anterior margin, surrounded by sparse ring of setae. Abdominal segment nine expanded dorsoapically, conical to subconical in dorsal view; bearing fringe of long slender setae and dorsal covering of short, spinose setae; urogomphi absent. Prothoracic leg with trochanter, and femur bearing ventral patches of globular or coarse, spinose setae; tibia with comb of stout, spinose setae on ventral surface.

Type species.—*Microschatia punctata* Solier, 1836:475, monobasic. From his description it is evident that Solier examined a single specimen, which is the holotype. We have not examined the Solier type, but his original illustration and the distinctiveness of *punctata* leave little doubt as to its identity.

Discussion.—The configuration of the ventral mouthparts separates *Microschatia* from all other North American Asidini except *Sicharbas*, *Stenosides* and *Astrotus*. In these genera the mentum closely contacts the postgenal processes and the gula is nearly as broad as the buccal cavity so that only a small space, at most, is left at the posterior corners. In other genera the mentum usually does not contact the postgenal processes. The gula usually forms a pedestal that is narrower than the buccal opening, leaving relatively large spaces at the corners. In most *Microschatia* the epipleuron is broad and reaches the elytral humerus, whereas in *Sicharbus*, *Stenosides* and *Astrotus* the epipleuron is narrow from base to apex. This character also separates *Microschatia* from other North American Asidini except *Litasida*, in which there are large paragular spaces at the corners of the buccal cavity. Other features useful in distinguishing *Microschatia* are the relatively short, cylindrical antenna with thick flagellar segments enlarged gradually from base to apex; and the thick, cylindrical tarsi (also occurring in *Stenosides*; somewhat thickened in *Gonasida*, *Glyptasida*).

No clear-cut secondary sexual characters are known for any species of *Microschatia*, but most individuals may be sexed by examining the curvature of the abdomen in



Figs. 10, 11. Configuration of internal female reproductive tracts of *Microschatia sulcipennis* (left) and *robustus* (right). The inset shows the spermatheca of *sulcipennis*.

lateral silhouette. In females the abdomen is usually continuously convex from the metacoxae to the base of the fourth sternite, with sternites two and three distinctly bulging. In males sternites one and two are usually flat or slightly concave and sternite three bulges only slightly compared with four and five. Among species which have been collected in significant series, females average about 4% larger (as measured by abdominal length) than males in *solieri*, 8% larger in *planata*, 16% larger in *inaequalis* and 22% larger in *championi*. However, these averages, which are based on specimens collected at the same locality and year, are based on relatively small samples of seven to twelve individuals. Antennae of males are about 15 to 25% longer relative to head width than are those of females, and the penultimate segment tends to be relatively longer in males.

Larvae of *Microschatia* differ from those which have been associated with other genera of Asidini in the complete absence of urogomphi. Larvae of *Philolithus*, *Gonasida* and *Glyptasida* have the urogomphi reduced to minute tubercles (Brown, 1971, 1973). In others the urogomphi are distinct and often large (e.g., *Stenomorpha*, Brown, 1973).

Acroschattia Wilke (1922) was proposed as a subgenus to contain *M. robusta* Horn, which is very similar in all important characters to *punctata* (the genotype) and *solieri*; *sulcipennis*, *rockerfelleri* and *morata* differ principally in the more complete and evenly narrowing epipleural carina. If a natural division were to be recognized in *Microschattia* it would separate the mainland Mexican species from the Pacific coastal ones, and *Acroschattia* would remain a junior synonym of *Microschattia*. *Pycnonotida* Casey was erected to contain *M. inaequalis* (LeConte), another LeConte species and a number of new species, all of which we synonymize with *M. inaequalis*. Our analysis shows that *inaequalis* is very similar to other *Microschattia*. Therefore *Pycnonotida* is placed as a junior synonym of *Microschattia*. Since all 12 species clearly form a monophyletic lineage we have chosen to recognize a single genus and two species groups, defined as follows:

Characterization of the punctata species group.—Labrum deeply, narrowly emarginate; eye slightly constricted by epistomal canthus; antennal segment 10 with patches of sensory tomentum subequal; pronotum almost as wide as base at widest point; posterior surface evenly convex, never bigibbose; prosternal process broadly rounded; elytra with humeral angle projecting forward when viewed ventrally; body with some setae spatulate or scale-like; dorsum partially encrusted with soil.

The punctata species group includes *M. punctata*, *solieri*, *robusta*, *sulcipennis*, *rockefelleri* and *morata*. These species occur on the central plateau of Mexico from Hidalgo to Chihuahua and Coahuila, and in adjacent parts of Arizona, New Mexico and Texas, in subarid or seasonally arid woodland habitats.

Characterization of the inaequalis species group.—Labrum broadly, shallowly notched to subtruncate; eye relatively deeply constricted by epistomal canthus; antennal segment 10 with outer patch of sensory tomentum much larger than inner; pronotum much narrower at base than at widest point; posterior border bisinuate or biangulate, conforming to shape of prominent gibbae; prosternal process broadly rounded to sagittate; elytra with humeral angle projecting at nearly right angles to body axis when viewed ventrally; body setae uniformly slender, hairlike.

The inaequalis species group includes *M. inaequalis*, *polita*, *championi*, *planata*, *costulata* and *cedrosensis*. These species occupy subarid or arid chaparral, savannah woodland or desert habitats from extreme southern California to the Vizcaino region of Baja California.

In the following key the first part of the figure designations refers to the figure numbers; the second part refers to the character numbers from Appendix 1 and indicated in small font on the figures. Thus, Figure 6:9b indicates character 9, state b, illustrated in Figure 6.

KEY TO THE SPECIES OF *MICROSCHATIA*

1. Labrum deeply notched (Fig. 1:b); pronotum only slightly narrower across posterior angles than at middle (Fig. 6:9b) and lacking gibbosities on posterior border; body with at least some scaliform setae (punctata species group) 2
- Labrum emarginate, not notched (Fig. 1:a); pronotum notably narrower across posterior angles than at middle (Fig. 6:9a) and with pair of gibbosities on posterior border; body with only slender, hairlike setae (inaequalis species group) 7
- 2(1). Epipleural carina distinct from humerus to elytral apex (Fig. 8:22a); epipleuron narrowed more abruptly just behind humerus, then gradually to apex (Fig. 8:21b); antennal length more than 1.3 times head width; 10th antennal segment subquadrate (Fig. 5:7a) 3
- Epipleural carina becoming obliterated about one-half to two-thirds distance to elytral apex (Fig. 8:22b); epipleuron narrowed gradually from humerus to posterior termination (Fig. 8:21a); antennal length less than 1.2 times head width; 10th antennal segment wider than long (Fig. 5:7b) 5
- 3(2). Pronotal disk with marginal setae much larger, broader and denser than central, hairlike setae; disk never obscured by adherent soil or debris 4
- Pronotal disk with setae slender or flattened, but of similar shape and size over entire surface; disk often obscured by adherent soil or debris *morata* Horn
- 4(3). Elytra with three to six distinct rounded, shiny costae; intercostae dull, shagreened; pronotum with marginal band of white scales incomplete on anterior and posterior borders (Fig. 16) *sulcipennis* Horn

- Elytra confluent and densely punctate, ecostate or with one or two indistinct costae; pronotum with all borders covered with narrow zone of white scales (Fig. 15) *rockefelleri* Pallister
- 5(2). Elytral disk reticulate or coarsely punctatorugose (Figs. 13, 14); usually with weak costae evident 6
- Elytral disk densely covered with large, round, discrete punctures, confluent only laterally and on epipleuron; without evidence of costae (Fig. 12) *punctata* Solier
- 6(5). Pronotum with broad, sharply defined marginal band of encrusted soil, leaving a smooth, subhexagonal central island with sparse punctures and irregular impunctate areas (Fig. 13); abdominal sternites with central impunctate areas *solieri*, new species
- Pronotum with narrow, indistinctly defined marginal band of encrusted soil; central area evenly, discretely and densely punctured (Fig. 14); abdominal sternites evenly punctate *robusta* Horn
- 7(1). Elytra distinctly and regularly costate (Figs. 31, 32) 8
- Elytra smooth, punctate or rugose, but without distinct costae (Figs. 33-35) 9
- 8(7). Pronotal disk with coarse, confluent punctures (Fig. 31) *cedrosensis*, new species
- Pronotal disk with fine, discrete punctures (Fig. 32) *costulata*, new species
- 9(7). Anterior and middle tibiae subcylindrical or elliptical in cross section; hind tibia usually straight; frons without tubercles 10
- Anterior and middle tibiae flattened, with outer margin carinate; hind tibia usually strongly sinuous; frons with tubercle at inner margin of eye *planata*, new species
- 10(9). Pronotal disk tuberculate; elytra coarsely rugose with overlay of fine tubercles (Fig. 33) *inaequalis* LeConte
- Pronotal disk finely to coarsely and confluent punctate; elytra punctate or punctatorugose 11
- 11(10). Body shiny; elytral punctures very small, sparse; posterior pronotal angles weak, obtuse (Fig. 34) *polita* Horn
- Body dull or with matte luster, not shiny; elytral punctures large, dense, often confluent; posterior pronotal angles strong, rectangular (Fig. 18) ... *championi* Horn

Microschatia punctata Solier
(Fig. 12)

Microschatia punctata Solier, 1836:475; Champion, 1884:66.

Black beetles with coarsely, evenly punctate elytra; head, lateral margins of pronotal disk, hypomera, legs and elytral punctures coated with pale, extremely fine textured earth.

Female.—Head coated with soil; frons with scattered punctures, each bearing a short whitish or yellowish, slightly flattened, decumbent seta. Epistoma deeply emarginate anteriorly, lateral margin angulately indented at epistomal suture, which is shallow, obscure. Eye with slightly raised prominence at apex of dorsal lobe; constriction about one-fourth as wide as dorsal lobe. Antenna about as long as head width, all but third segment wider than long; moderately densely set with fine, pale setae; segment 2 less than half as long as segment 3; segment 10 slightly wider than long, asymmetrical; eleven nearly symmetrical. Mentum broadly emarginate with narrow, deep, medial notch. Ligula about one-third wider than notch in mentum, retractile, often scarcely visible. Postgenal process nearly right angled, with rounded apex. Gular pedestal deeply, angulately emarginate.

Pronotum widest slightly behind middle, three-fourths as wide across anterior



Fig. 12. *Microschatia punctata* Solier.

angles as basal; anterior angles slightly acute, posterior angles obtuse, scarcely extended posteriad; lateral margins thick, narrowly explanate; posterior margin biangulate, nearly straight medially; disk with scattered, coarse, deep to shallow, earth-filled punctures covering anterior quarter and narrow medial band or entire central portion of posterior two-thirds; slightly concave medially near posterior margin; lateral zones of disk caked with earth through which punctures with tiny, flattened, whitish setae are obscurely visible. Hypomeron solidly caked with earth through which few, scattered, pale setae project. Prosternum with sparse, deep, coarse, setiferous punctures, sometimes with impunctate longitudinal zone.

Elytra with base slightly narrower than base of thorax; disk covered with coarse,

discrete, earth-filled punctures larger than width of eye and separated by less than puncture width, becoming somewhat coalesced laterally. Epipleural carina indistinct in anterior third, not evident posteriorly; epipleuron rapidly narrowing from humerus to first sternite, then narrowing more gradually and disappearing. Abdominal sternites alutaceous with sparse, fine to moderately coarse setiferous punctures, especially laterally and on sternite five.

Femora finely punctate, partially covered with adherent earth; setae sparse, whitish, slightly flattened, decumbent. Middle and hind tibia subcylindrical, covered with adherent earth and sparse mixture of short, coarse, suberect brownish spines and whitish, slightly flattened, decumbent setae; anterior tibia with fine setae anterodorsally, spines ventrally; tarsi mostly setose dorsally, mostly spinose ventrally.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 4.6 to 5.4 mm; greatest pronotal width, 6.5 to 7.7 mm; elytral length 10.0 to 12.8 mm; greatest elytral width 8.0 to 9.8 mm.

Type.—Not examined. Solier's description is based on a single individual, which is the holotype. The identity of *punctata* is clear from the description and accompanying illustration.

Type locality.—Mexico.

Diagnosis.—*Microschatia punctata* is most similar to *M. solieri* Brown and Doyen. In *punctata* the elytral depressions are round, subequal in size, and rarely coalesced on the disk. They are evenly distributed, without trace of longitudinal ridges. In *solieri* the depressions are round to very irregular in shape and often coalesced, producing a rugose appearance. Areas without depressions form three very weakly elevated longitudinal ridges extending onto the declivity.

Distribution.—Queretaro, Mexico.

Material examined.—Mexico, no additional data (1); F. Bates (1); Sallé Collection (1); Queretaro, 1 mi N Peña Blanca, IX-13-1970, (1).

Microschatia solieri, new species

(Fig. 13)

Microschatia punctata, Champion, 1892:503; Horn, 1893:140; Casey, 1912:94.

Black beetles with rugose, subcostate elytra; head, lateral margins of pronotal disk, hypomera, legs and elytral depressions coated with pale, extremely fine textured earth.

Female.—Very similar to *M. punctata* Solier, except for following features: pronotal disk with lateral, earth coated zone usually extending at least partway along posterior margin. Elytral disk with round to very irregular, earth coated depressions, producing rugose appearance. Elevations between depressions more-or-less coalesced into sutural and two paramedial ridges, producing subcostate appearance in most individuals. Abdominal sternites with discrete bands of earth coating lateral fifths.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 4.7 to 5.5 mm; greatest pronotal width 6.7 to 7.5 mm; elytral length 10.2 to 12.7 mm; greatest elytral width 7.6 to 9.4 mm.

Holotype female (OSU) and 5 female, 3 male paratypes from Mexico, Hidalgo, 2 mi SE Zimapan, VI-24-1975, L. E. Watrous. Additional paratypes (sex not determined) from Hidalgo, as follows: Ixmiquilpan, XI-12-1946, P. E. Skinner (2); VI-1963, F. D. Bennett (1); Ixmiquilpan, 10 mi N, 7,000', VI-22-1982, R. L. Aalbu; 7



Fig. 13. *Microschatia solieri* Brown and Doyen.

mi W Pachuca, VI-24-1975, L. E. Watrous (4); El Tablon, 7 mi SW Zimapan, VIII-19-1964, J. and W. Ivie (6); 2 mi N Tasquillo, Rio Tula, 5,300', VI-28-1965, N. Chornoff (2); Zimapan, Hoge (15); Zimapan, VI-11/14-1951, P. D. Hurd (1); Zimapan, 2 mi SE, VI-24-1975, C. A. and B. W. Triplehorn, L. Watrous, Q. D. Wheeler (5). Zimapan, 3 mi S, VI-25-1971, Ward and Brothers (1).

Diagnosis.—*Microschatia solieri* is most similar to *M. punctata* Solier, under which the differences are enumerated. It also resembles *M. robusta* Horn, but in *solieri* the pronotal disk is laterally impunctate or finely, obscurely punctate, usually with irregular impunctate central areas as well (entire disk uniformly, coarsely punctate in *robusta*). In *solieri* the posterior pronotal angles are slightly produced posterad and appear obtuse or nearly right-angled; the disk bears a broad medial depression near the posterior border. In *robusta* the posterior pronotal angles are strongly produced

and acute; the disk is evenly convex across the posterior quarter. The elytra of *solieri* have many strong, transverse ridges connecting the lateral ones. In *robusta* the transverse ridges are much finer than the longitudinal ones and often do not connect adjacent ridges. Examination of specimens in the British Museum from Zimapan identified as *M. punctata* by Champion showed that they are *solieri*, not *punctata*. These were briefly described as "var." by Champion (1892:503).

Distribution.—Hidalgo, Mexico.

Microschatia robusta Horn

(Fig. 14)

Microschatia robusta Horn, 1893:142; Pallister, 1954:14.

Acroschattia robusta, Wilke, 1922:269.

Black beetles with subcostate to costate, weakly reticulate elytra; head, pronotal punctures, hypomera, elytral depressions and legs coated with pale, extremely fine-textured soil.

Female.—Similar to *M. punctata* Solier, except for following features: pronotum three-fifths as wide across anterior angles as posterior; anterior angles about 90°, posterior angles acute, strongly produced posterad; lateral margins thick, narrowly explanate, upturned; posterior margin arcuate between posterior prominences, slightly flattened medially. Disk uniformly covered with coarse, shallow, contiguous or subcontiguous, minutely setiferous punctures filled with earth; evenly convex across posterior quarter, or very weakly concave in middle. Hypomeron solidly caked with earth, largely obscuring sparse setiferous punctures. Prosternum tuberculately punctate anterolaterally; with sparse, coarse, setiferous punctures medially and on prosternal process.

Elytral base equal in width to base of thorax with humeri projecting prominently forward, bearing slight indentation for posterior pronotal angles; disk with sutural and two paramedial costae interconnected by finer, raised reticulations; depressions coated with earth through which project sparse, flattened, minute, whitish setae. Abdominal sternites with anterolateral quadrants coated with earth. Femora finely, shallowly punctate, punctures filled with earth, or anterior femora solidly coated.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 4.0 to 4.8 mm; greatest pronotal width 6.3 to 7.5 mm; elytral length 8.7 to 12.0 mm; greatest elytral width 7.0 to 9.1 mm.

Holotype.—Museum of Comparative Zoology, Harvard University, sex not determined.

Type locality.—Mexico, Coahuila.

Diagnosis.—*Microschatia robusta* is similar to *M. solieri* Brown and Doyen. Differences are detailed under the latter. It is similar in most characters to *M. punctata* Solier, but is easily separated by the prominent posterior pronotal angles and reticulately sculptured elytra (pronotal angles scarcely produced; elytra coarsely punctate in *punctata*).

Pallister (1954) believed *robusta* to be very closely related to *morata* Horn, stating that it would probably eventually prove to be the same species. However, *robusta*, *punctata* and *solieri* are clearly related by the abruptly narrowed epipleuron, by the



Fig. 14. *Microschatia robusta* Horn.

well developed earthen coating of the body and by the presence of pale setae on both dorsum and venter, including the femora. In contrast, in *morata*, *sulcipennis* and *rockefelleri*, the epipleuron narrows continuously and the earthen coating is scant, whereas the peripheries of the pronotal and elytral disks are thickly lined with whitish scales (always absent in the *punctata* group). The body and leg setae of the *morata* group are uniformly dark colored. Additional synapomorphies and differences between each group are specified on Figure 9.

Distribution.—Northeastern Mexico and extreme southeastern Texas.

Material examined.—Texas, Cameron County, Brownsville, IV-27-1962, intercepted with cactus (1); Kleberg County, Kingsville (1). Mexico, Neuvo Leon, Las Margaritas, VIII-11-1965 (4) 29 km N San Cayetano de las Vacas, V-31-1981 (1). Tamaulipas, Condalia (1).

Microschatia rockefelleri Pallister
(Fig. 15)

Microschatia rockefelleri Pallister, 1954:15.

Black beetles with pronotum, lateral edges of elytra and posterior third of medial elytral suture highlighted with white scales.

Female.—Head not coated with earth; dorsum with semicircle of dense, blunt tipped, white scales running from lateral epistomal sutures, between eyes and just before pronotal margin; central part of frons with punctures much sparser, bearing slender brownish or blackish setae, sometimes with few white scales intermingled. Epistoma shallowly emarginate anteriorly, angulately indented at epistomal sutures. Eye with slight to moderate prominence at apex of dorsal lobe; constriction about one-fifth as wide as dorsal lobe. Antennal length about one and one-fourth times head width; segments four to seven slightly longer than wide; eight subquadrate; nine wider than long; ten subquadrate, almost symmetrical; eleven nearly symmetrical; all segments set with moderately dense, coarse, black setae. Mentum set with coarsely setiferous punctures; broadly emarginate with shallow medial notch. Ligula almost twice as wide as notch, small but always visible. Postgenal process nearly right-angled with rounded apex. Gular pedestal arcuately to angulately emarginate.

Pronotum widest slightly behind middle, three-fifths as wide across anterior angles as basal; anterior angles slightly acute with rounded apex; posterior angles acute, distinctly produced posterad; lateral margins thick, very narrowly explanate; posterior margin arcuate between posterior prominences. Disk uniformly convex; borders narrowly covered by contiguous or overlapping, blunt tipped, white scales; central seven-eighths more sparsely set with setigerous punctures; setae either slender, flattened or a mixture, either brownish or whitish. Hypomeron sparsely set with fine punctures supertended by short, coarse setae. Prosternum tuberculopunctate laterally, becoming setiferously punctate medially and on process. Prosternal process broadly rounded.

Elytral base subequal to thoracic base; disk rugose; depressions shagreened, lightly coated with earth; ridges black, epipleural margin and posterior one-fourth to one-third of sutural margin narrowly lined with dense, blunt tipped, white scales; central areas sparsely covered with sparse, brownish, somewhat flattened setae. Epipleural carina distinct; epipleuron asperate, gradually narrowing from base to elytral apex. Abdominal sternites uniformly, moderately densely set with setiferous punctures; setae slender, brown.

Femora moderately densely set with setiferous punctures; setae black, declined. Middle and hind tibia moderately densely covered by mixture of black setae and shorter, coarser, black spines; anterior tibia subcylindrical with setae anteriorly, setae and spines posteriorly. Tarsi setose dorsally, mostly spinose ventrally.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 4.5 to 4.9 mm; greatest pronotal width 6.6 to 7.5 mm; elytral length 9.5 to 12.3 mm; greatest elytral width 7.4 to 8.8 mm.

Holotype male.—American Museum of Natural History, New York.

Type locality.—Mexico, Chihuahua, 25 mi SW Camargo.

Diagnosis.—The fringe of white scales bordering the pronotal and elytral disks distinguishes *M. rockefelleri* from all other species except *morata* Horn and *sulci-*



Fig. 15. *Microschatia rockefelleri* Pallister.

pennis LeConte. In *morata* there is occasionally an indistinct fringe of whitish scales on the elytra. However, the thorax and head of *morata* are uniformly sparsely covered by slightly flattened setae, contrasting with the distinct patterning of *rockefelleri*. In addition, each elytron of *morata* bears three narrow, uneven longitudinal carinae; the elytra of *rockefelleri* are uniformly rugose, with only a faint indication of longitudinal pattern in some individuals.

In *sulcipennis* the elytra each bear a sutural and three to five distinct discal costae. The intercostal areas are shagreened, without the coating of earth characteristic of *rockefelleri*. In *sulcipennis* the fringe of white setae is narrower than in *rockefelleri* and is usually incomplete on the anterior and posterior margins.

Distribution.—Durango and Chihuahua, Mexico.

Material examined.—Mexico, Chihuahua, 17 mi SE Ciudad Camargo, VII-30-

1974 (1); 42 mi SW Camargo, 4,900', VII-15-1947 (2); Ciudad Jimenez, 21 mi SE, VII-8-1986, 4,720' (2); Ciudad Jimenez, 10 mi N, VII-17-1969 (1); Hidalgo de Parral, 5,500', VII-17-1947 (1); VII-31-1959 (1). Durango, 4 mi S Casco, VI-16-1960, 5,800' (2); 2 mi NW Nombre de Dios, VII-31-1959, 5,500' (1).

Microschatia sulcipennis LeConte

(Fig. 16)

Microschatia sulcipennis LeConte, 1858:18; Horn, 1870:282; 1893:142.

Black beetles with sulcate elytra and narrow, obscure fringes of whitish scales around margins of pronotum and elytra.

Female. — Body usually lacking coating of soil. Head with sparse band of punctures bearing blunt-tipped, whitish scales running from each epistomal suture to prominence above eye, sometimes continuing briefly mesad, but always broadly interrupted across vertex. Central part of frons with punctures much sparser, bearing slender or slightly flattened blackish or brownish setae. Epistoma shallowly emarginate anteriorly, angulately indented at epistomal sutures. Eye with slight prominence at apex of dorsal lobe; constriction about one-fourth as wide as dorsal lobe. Antennal length about one and one-third times head width; segments four to eight slightly longer than wide; nine and ten subquadrate, ten and eleven almost symmetrical; all segments set with moderately dense, coarse, black setae. Mentum broadly emarginate with shallow, V-shaped to arcuate medial notch. Ligula almost twice as broad as notch, small but visible. Postgenal process nearly right angled or obtuse, apex broadly rounded. Gular pedestal shallowly, angulately or arcuately emarginate.

Pronotum widest slightly behind middle, slightly more than one-half as wide across anterior angles as basal; anterior angles slightly acute with rounded apex; posterior angles acute, distinctly produced posterad; lateral margins thick, very narrowly explanate; posterior margin arcuate between lateral prominences. Disk uniformly convex; lateral borders margined by narrow zone of contiguous or subcontiguous white, blunt tipped scales; anterior and posterior borders with scales lacking or attenuating medially, never continuous; central nine-tenths more sparsely set with setigerous punctures; setae slightly flattened, brownish or blackish. Hypomeron and prosternum as in *rockefelleri*.

Elytral base narrower than thoracic base; disk with sutural and five lateral costae on each side, alternately weaker and stronger; costae weakly interconnected by irregular transverse elevations, producing a somewhat rugose appearance in some individuals; entire surface shagreened, dull; epipleural margin very narrowly lined with whitish or yellowish, blunt-tipped scales, sometimes interrupted or disappearing posteriorly; suture sometimes with short row of whitish scales near apex. Epipleural carina distinct; epipleuron asperate, gradually narrowing from base to elytral apex. Abdominal sternites very finely, uniformly and moderately densely set with minutely setiferous punctures; setae brownish. Legs as in *rockefelleri*.

Male. — Differs as indicated in generic description.

Measurements. — Pronotal length 4.3 to 5.0 mm; greatest pronotal width 6.3 to 7.5 mm; elytral length 9.9 to 11.7 mm; greatest elytral width 7.0 to 8.6 mm.

Holotype (sex not determined). — Museum of Comparative Zoology, Harvard University.



Fig. 16. *Microschatia sulcipennis* LeConte.

Type locality.—Texas, Llano Estacado.

Diagnosis.—*Microschatia sulcipennis* is most similar to *rockefelleri* Pallister. Differences are detailed under the latter. Some individuals of *M. morata* have a narrow border of whitish or yellowish setae on the lateral elytral margins. The setae, however, are only slightly flattened and much less scale-like than in *sulcipennis* or *rockefelleri*. The pronotal disk of *morata* is never set off with a border of white scales. In addition, in *sulcipennis* each elytron bears six quite rectilinear costae. In *morata* each elytron has three discal and a weak sutural carinae, which are sinuous and much narrower than those of *sulcipennis*.

Distribution.—Western Texas. No records are known for adjacent parts of New Mexico or Mexico.

Material examined.—Texas, Big Bend, VI-1965 (1); Brewster County, Big Bend National Park, Chisos Mountains, The Basin, 5,400', VIII-14-1948 (2); 4,000', V-27-1952 (2); VIII-1-1973 (2); Green Valley, VII-20 (2). Culberson County, Frijole, VII-15-1933 (1); Guadalupe Mountains National Park, VII-17-1974 (1); Pine Springs, VII-12-1928 (3); 2 mi NW Pine Springs, VIII-14-1965 (2).

Microschatia morata Horn

(Fig. 17)

Microschatia morata Horn, 1878:56; 1893:141.

Black beetles, sometimes appearing brown or blackish brown because of adhering earth; elytra each with three somewhat sinuous, narrow, rounded carinae.

Female.—Head not coated or with very light coating of earth; dorsum with setiferous punctures, sparse on frons, becoming denser near eyes and lateral epistomal sutures; setae flattened, pointed, yellowish or whitish on frons, becoming slender, hairlike on epistomal margin. Epistoma moderately, arcuately emarginate anteriorly, angulately indented at epistomal sutures. Eye with slight to moderate prominence at apex of dorsal lobe; constriction about one-fourth to one-fifth as wide as dorsal lobe. Antennal length about one and one-fourth times head width; segments four to seven subquadrate, eight and nine wider than long; ten subquadrate, nearly symmetrical with tomentose sensory patches subequal; eleven nearly symmetrical; all segments set with moderately dense, coarse, black setae. Mentum broadly emarginate with shallow medial notch. Ligula almost twice as broad as notch, small but exposed. Postgenal process nearly right angled with rounded apex. Gular pedestal angulately emarginate.

Pronotum widest about three-fourths distance from apex to base; slightly more than one-half as wide across anterior angles as basal; anterior angles slightly acute with rounded apex; posterior angles approximately right angled or slightly acute, slightly to moderately produced posterad; lateral margins thick, very narrowly explanate; posterior margin arcuate or very weakly bisinuate between lateral prominences. Disk uniformly convex; coarsely, shallowly and contiguously to confluent set with setiferous punctures; central area with few slightly raised, very irregular, anastomosing ridges, producing rugose appearance; setae flattened, yellowish or whitish, pointed in central part of disk, sometimes with blunt tips peripherally. Hypomeron sparsely set with punctures bearing flattened, yellowish or whitish setae; prosternum with flattened setae laterally; spinose, dark setae medially and on process. Elytral base wider than or subequal to thoracic base; disk with weak sutural and three stronger lateral costae on each side; costae narrow, rounded, somewhat sinuous and occasionally interconnected by irregular, sinuous transverse ridges, giving sparsely rugose appearance; costae and ridges shiny black; depressions shagreened, dull, very sparsely set with slender brownish or blackish setae; epipleural margin of each elytron sparsely lined with irregular, occasionally interrupted row of whitish, flattened, blunt-tipped setae; similar setae sometimes forming very narrow row along posterior third of suture. Epipleural carina distinct; epipleuron asperate, gradually narrowing from base to apex. Abdominal sternites uniformly, moderately densely set with setiferous punctures; setae slender, brownish or blackish. Legs as in *rockefelleri*.



Fig. 17. *Microschatia morata* Horn.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 3.1 to 4.5 mm; greatest pronotal width 4.9 to 6.5 mm; elytral length 8.6 to 10.6 mm; greatest elytral width 5.9 to 8.3 mm.

Holotype (sex not determined).—Museum of Comparative Zoology, Harvard University.

Type locality.—Grant County, New Mexico.

Diagnosis.—*Microschatia morata* is similar to *sulcipennis* LeConte and *rockefelleri* Pallister in having the elytra margined with white, scale-like setae. In the last two species the setae are almost as broad as long, with very blunt, almost truncate apices. In *morata* the setae (as well as those on the thoracic margins) are distinctly longer than broad, with the apices rounded (usually pointed on the thorax). Additional differences are detailed under the other two species.

Distribution.—Southeastern Arizona, southwestern New Mexico south to Durango, Mexico.

Material examined.—Arizona, Cochise County, VII-23-1908 (1); no date (1); Chiricahua Mountains (1); Chiricahua Mountains, VII-22-1961 (1); VII-30-1963 (1);

Huachuca Mountains (3); VII-18-1938 (1); Miller Canyon, VI-4-1982 (1); VII-10 (1); VII-21 (1); VII-22-1981 (1); Ramsey Canyon, VII-19-1912 (1); Palmer Lee, VII-13-1907 (5); VII-27-1907 (1). Santa Cruz County, Mount Washington [near Nogales], 6,000', VII-13-1919 (1). New Mexico, no additional data (2); Catron County, Luna, VIII-31-1935 (1). Doña Ana County, 8 mi E Las Cruces, 5,700', VII-19-1973 (1). Socorro County, Magdalena (1). Mexico. Chihuahua, Madera, 12.6 mi S, VII-6-1986, 7,500' (1); Primavera, 5,500–6,000', VI-30-1947 (1); Santa Barbara, 6,200', II-17-1947 (1); IV-24-1947 (1); V-10-1947 (1); La Saucedá, 7,000', VII-21-1947 (1). Durango, 4 mi NNE Boquilla, 6,200', VII-15-1960 (1). Sonora, Minas Nuevas, VII-7-1952 (3).

Microschatia championi Horn
(Fig. 18)

Microschatia punctata Horn, 1870:282 (not Solier, 1836).

Microschatia championi Horn, 1893:140.

Black beetles with finely to coarsely punctate pronotum and coarsely to very coarsely punctate or punctatorugose elytra.

Female.—Frons and epistoma with dual punctation; coarser, setiferous punctures several times diameter of eye facets; finer punctures much smaller than eye facets, not appearing setiferous. Epistoma shallowly, arcuately emarginate anteriorly, scarcely indented at epistomal sutures. Eyes without prominence at apex of dorsal lobe; constriction slightly more than one-third as wide as dorsal lobe. Antennal length about one and one-fourth times head width; segments four to seven slightly longer than wide, eight subquadrate, nine and ten wider than long; ten asymmetrical, with outer half larger; eleven strongly asymmetrical; segments two to ten set with moderately dense, coarse black setae; eleven with setae only on inner angle. Mentum broadly, very shallowly emarginate with shallow median notch. Ligula almost twice as broad as notch, always exposed. Postgenal process obtuse with broadly rounded apex. Gular pedestal slightly to moderately emarginate.

Pronotum widest at middle or slightly before, then distinctly constricted to base; about three-fifths as wide across anterior angles as basal; anterior angles nearly right angled with broadly rounded apex; posterior angles nearly right angled, not produced posterad; lateral margins thick, moderately explanate; posterior margin biangulate, with middle part almost twice width of lateral parts. Disk shallowly and sparsely punctate with punctatorugose lateral zones to deeply and coarsely or confluent punctate over entire surface; punctures minutely setiferous. Hypomeron nearly impunctate to deeply, coarsely punctate. Prosternum finely to coarsely punctatotuberculate laterally, becoming coarsely punctate or punctatorugose medially and on process; process narrowly rounded or sagittate.

Elytral base wider than or subequal to thoracic base; disk with sparse punctures slightly larger than those of thorax and arranged in rows medially, becoming more coarsely, densely and irregularly punctate laterally and punctatorugose near epipleuron or occasionally punctatorugose or rugose throughout. Epipleural carina fine, distinct from humerus to elytral apex; epipleuron smooth to rugulose, abruptly narrowing posterad of humerus, then gradually to apex. Abdominal sternites uniformly,



Fig. 18. *Microschatia championi* Horn.

moderately densely set with fine to coarse, minutely setiferous punctures; setae blackish. Legs as in *rockefelleri*.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length, 4.5 to 5.6 mm; greatest pronotal width 6.3 to 8.6 mm; elytral length 10.5 to 14.5 mm; greatest elytral width 7.7 to 10.7 mm.

Lectotype (sex not determined).—Museum of Comparative Zoology, Harvard University.

Type locality.—Peninsula of lower California.

Diagnosis.—In general appearance *Microschatia championi* is similar to *cedrosensis* Brown and Doyen and *costulata* Brown and Doyen. However, *championi* has the elytra punctate or rugose, while the other two have distinctly costate elytra. In addition both *cedrosensis* and *costulata* are more slender and elongate (elytral length/width = 1.49 to 1.53) than *championi* (elytral length/width = 1.24 to 1.45).

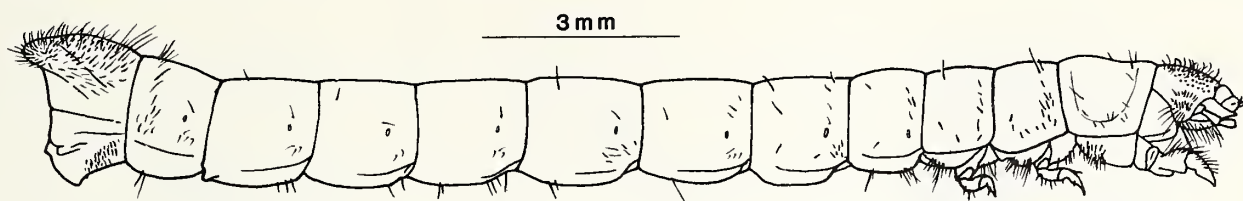
Variation.—Five individuals have very coarsely punctate pronota and coarsely punctate or punctatorugose elytra, in contrast to the finer sculpturing usually encountered. All of these individuals are from relatively low elevations (0 to 100 m) in the northern (San Quintin) and southern (25 mi N Guerrero Negro; El Arco; Juanito Cove, 33 mi N Loreto) parts of this species' range. However, the few other individuals known from these areas (San Telmo, Santa Rosa in the north; near Punta Prieta in the south) have the typically finer sculpturing. The few specimens from southern California do not vary significantly from typical individuals in the central part of the range.

Distribution and habitat.—Extreme southern California to Loreto, Baja California Sur. A single specimen from the University of Arizona collection is labeled from Organ Pipe Cactus National Monument, Pima County (see material examined). This locality is so removed from the documented range of *M. championi*, that it should be regarded as questionable until verified by additional collections.

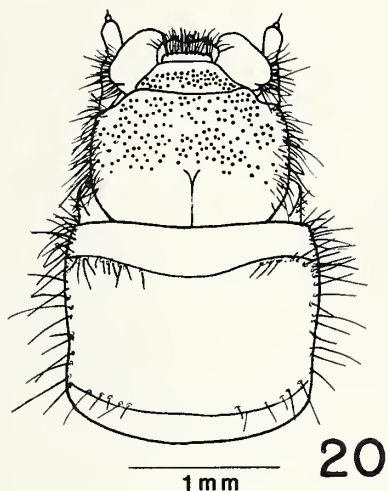
Relatively large collections of *M. championi* have been made along Arroyo Catavina in the vicinity of the Rancho Santa Ynez, Baja California Norte. This is an uplifted (about 500 to 700 m elevation), granitic region with palm oases situated in ravines with permanent surface or subsurface water. The beetles occur in the relatively moist, sandy areas about the oases, where they are active crepuscularly. Another tenebrionid, *Eusattus catavinus*, is narrowly endemic to this uplifted area of palm oases (Doyen, 1984:46).

Material examined.—United States. Arizona, Pima County, Organ Pipe Cactus Nat. Mon., Ajo Mtns, Alamo Canyon, XII-17-1980 (1). California, Imperial County, Colorado Desert, I-14-1950 (1); Davies Valley, II-22-1970 (1); Mountain Springs, IV-4-1930 (1) III-27-1979 (1). Mexico. Baja California Norte, Agua de Refugio, IV-1-1935 (1); El Arco, I-20-1965 (1); Arroyo Catavina, 35 mi S El Progreso, IV-2-1976 (29); 2.5 mi NW Catavina, VII-13-1979 (1); 5 mi N, 1 mi W Catavina, IV-5-1981 (1); 10 mi N Catavina, IV-4-1977 (1); 25 mi N Guerrero Negro, I-20-1972 (2); 5 mi N Punta Prieta, IX-5-1951 (1); 20 mi N Punta Prieta, III-29-1973 (1); 38 mi S Punta Prieta, III-27-1935 (1); Rancho Santa Ynez, I-3-1977 (1); 2 mi N Rancho Santa Ynez, III-27-1973 (3); 6 km NW Rancho Santa Ynez, 1,800', I-1976 (23); 9 km NW Rancho Ynez, 550 m, IV-4/30-1978 (15); inland from San Quintin, V-26-1956 (1); 5 mi W San Telmo, I-9-1976 (1); Santa Rosa (no date) (1); 1 mi N El Socorro, III-25-1973 (1). Baja California Sur, San Juanito Cove, 33 mi N Loreto, XII-24/26-1986 (1); 7 km N Rancho Tablon (27°37'N, 113°21'W), 130 m, I-1-1982 (2).

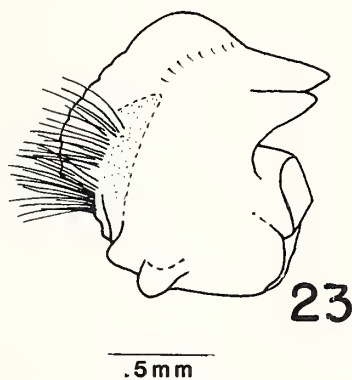
Description of late instar larva (Figs. 19–30). Length 36–42 mm; head capsule width 2.7–3.5 mm; five specimens, probably representing two instars, according to head capsule widths; semicylindrical dorsally, flattened ventrally; pale creamy white



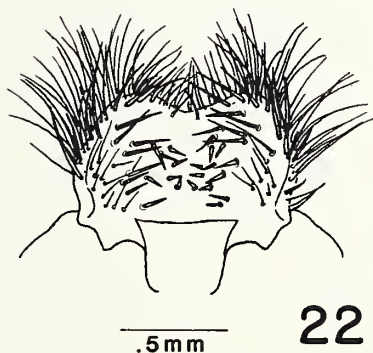
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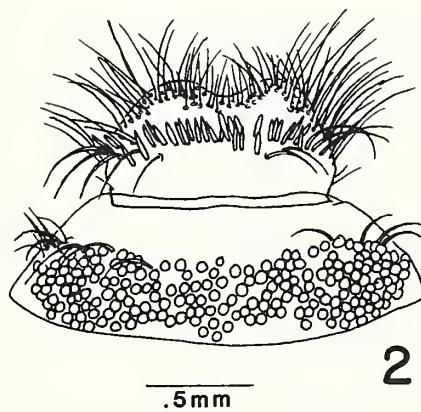
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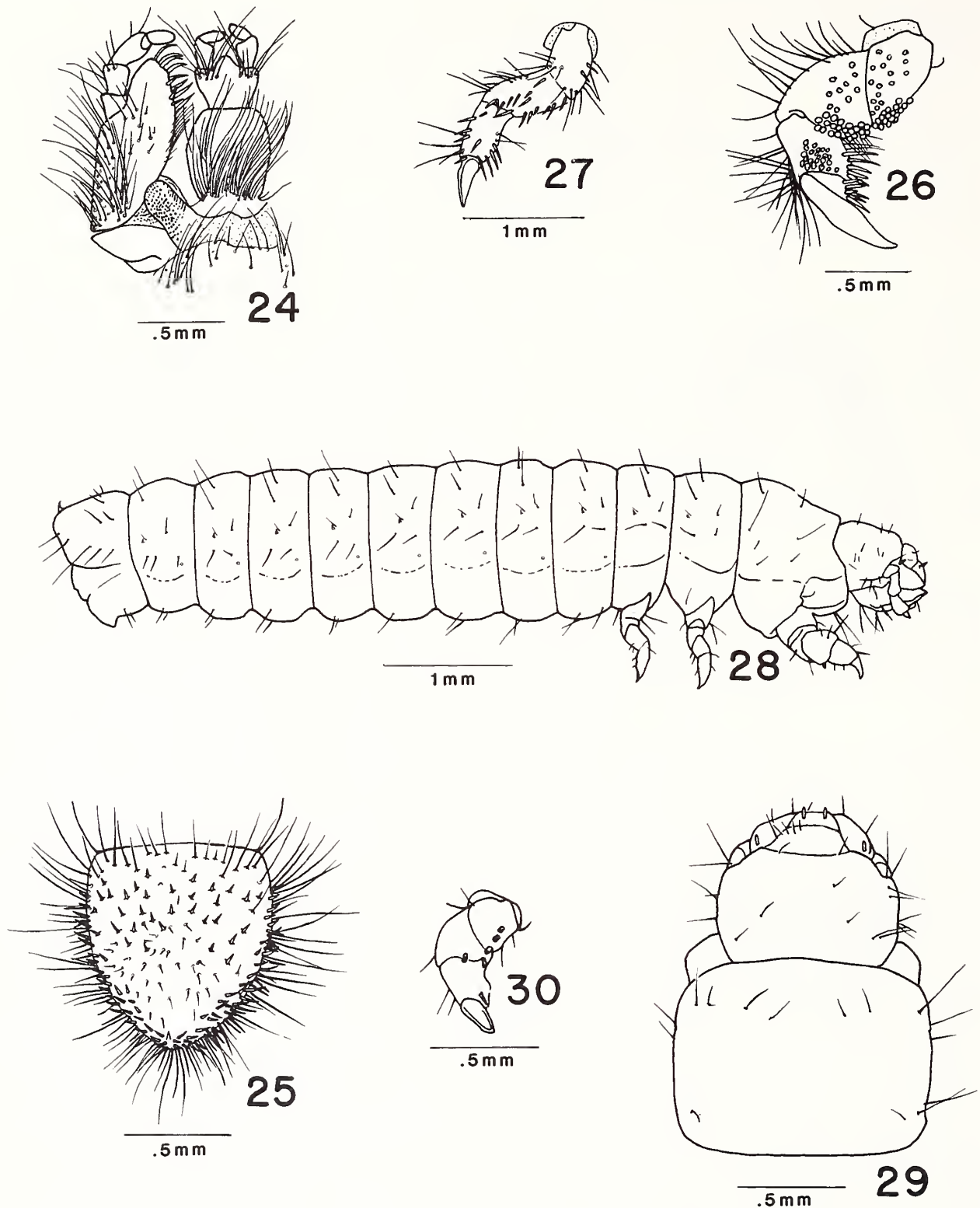


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Figs. 19–23. Structures of late instar larva of *Microschatia championi*. 19. Lateral aspect of larva. 20. Dorsal aspect of head and pronotum. 21. Dorsal aspect of clypeus and labrum. 22. Epipharynx. 23. Dorsal aspect of left mandible.

to yellow, except for dark claws, mandibular apices, oral rim and cuticular granules on head and legs.

Cranium densely granulate over anterior two-thirds of dorsum (Fig. 20), sparsely set with posteriorly declined setae about half-length of second antennal segment (not shown in Fig. 20), these arising between granules; genae densely set with stout setae about as long as second antennal segment, becoming longer, more slender ventrolaterally and in parangular region. Clypeus (Fig. 21) with nearly contiguous granules in posterior half, few setae laterally, glabrous anteriorly. Labrum with irregular transverse median row of flattened spines about half length of second antennal segment;



Figs. 24–29. Structures of larval *Microschatia championi*. 24. Maxillolabium of late instar. 25. Dorsal aspect of ninth abdominal tergite of late instar. 26. Posterior aspect of foreleg of late instar. 27. Posterior aspect of mesothoracic leg of late instar. 28. Lateral aspect of first instar larva. 29. Dorsal aspect of head and pronotum of first instar. 30. Foreleg of first instar.

anterior margin with longer, slender setae (Fig. 21); epipharynx with stout tormal arms; epipharyngeal setae stouter medially, in confused array (Fig. 22). Antenna with second segment slightly shorter than first; third segment papillate. Mandibles (Fig. 23) with prominent preapical gibbosity, more abruptly developed on right; left mandible with small, blunt, preapical tooth on dorsal margin. Maxilla with proxicardo

leathery, finely granulose; disticardo sclerotized, glabrous; mala with fine, long setae on lateral basal two-thirds of outer surface (Fig. 24); inner margin with double row of stout spines, becoming longer and curved apically, becoming slender, hairlike basally. Mentum with dense, long projecting setae in posterior half, glabrous anteriorly (Fig. 24); prementum sclerotized, with brush of long setae near anterior corners; hypopharyngeal sclerome with molar surface subovoid in anterior aspect, shallowly excavate, without distinct cusps; ligular surface with numerous long, slender, anterodorsally directed setae. Submentum asetose, covered with fine granules; gula sclerotized, with numerous long setae.

Prothorax (Figs. 19, 20) with anterior sixth, posterior eighth and anterior half of lateral margins very finely granulose, appearing pigmented; granulose anterior and posterior regions subtended by rows of sparse, fine setae, these forming a broad band laterally; few setae elsewhere; epipleurum and basal half of sternellum with dense, long, slender, projecting setae; sternum granulose, without setae. Mesothorax with posterior sixth of notum exceedingly finely granulose, with sparse row of setae near anterior margin, broadening into sparse band laterally; sternum, epipleurum and sternellum with long, fine, projecting setae. Metathorax similar to mesonotum, but without granulose posterior margin.

Abdominal segments one through seven similar, subquadrate in dorsal aspect; dorsum with sparse rows of very fine setae near anterior margin, most evident laterally near spiracle; posterior margin sometimes with few fine setae; spiracle elongate elliptical, of annular type, subtended by four setae; sternum with sparse band of fine setae along anterior margin, single seta on each side three-fourths distance to posterior border. Eighth abdominal segment similar, but with row of fine setae near posterior margin and cluster of setae posterolaterally. Ninth segment (Fig. 25) with tergum tapering to acutely rounded apex; dorsal surface densely set with short spines, mostly directed anterodorsad; sparsely set with longer, fine setae, also directed anterodorsad; urogomphi absent; lateral tergal margins densely set with long, fine setae; ventral margin of tergum with narrow band of short spines bordering concavity receiving tenth sternite (Fig. 19); tenth sternite with short spines laterally and on pygopods.

Prothoracic leg (Fig. 26) with dense clusters of nearly contiguous globular granules on mesal surfaces of trochanter and femur; posterior surfaces of trochanter, femur and tibia less densely set with granules; mesal apex of femur, mesal surface of tibia and base of claw bearing combs of stout spines; ectal surfaces of femur and tibia with brushes of long, slender setae. Meso- and metathoracic legs (Fig. 27) mesally with irregular combs of spines, ectally with longer, slender setae; claws without setation.

First instar larva (Fig. 28).—Length 5.1 mm; head capsule width 0.75 mm. Pale creamy white except for tan urogomphi, egg bursters, tips of claws and mandibles, and clavate setae on labrum and mandibular base. Six specimens, one pharate with setation of second instar visible through cuticle.

Cranium finely rugulose with few slender setae. Mandibles each with single large articulated fusiform spine near base of lateral margin (Fig. 29). Labrum with similar paramedial spines. Prothorax rugulose with sparse transverse row of about five extremely fine, pale setae back from anterior margin (Fig. 29); similar sparse row near posterior margin; egg bursters absent. Mesothorax and metathorax with few pale, extremely fine setae near posterior margin; short, spinose egg burster located laterodorsally on each side slightly behind middle, supertended closely by fine seta. Ab-

dominal segments one through eight similar, slightly larger than metathorax; each segment with few extremely fine, pale setae and egg burster located as on metathorax. Ninth abdominal segment parabolic in dorsal aspect, with pair of subcontiguous, strongly divergent, short and sharply pointed urogomphi at apex; dorsal surface with few extremely fine, pale setae; pygopods short, fleshy, without spination; spiracles circular. Prothoracic leg (Fig. 30) with three stout, blunt, clavate pigmented spines on mesal surface of trochanter; two on femur and single sharp spine on tibia, subtending claw; ectal surfaces with few extremely fine setae. Mesothoracic and metathoracic legs with few fine setae.

In addition 16 specimens of various intermediate instars (second onwards) were examined. These are similar to late instar specimens, but have fewer granules on the cranium, legs and ninth abdominal tergum, as described by Brown (1973) for *Philolithus*.

Egg.—Elongate ovoid as described by Brown (1973); length 3.7 mm, width 1.1 mm. Chorion very finely, shallowly rugulose.

The larvae examined were laboratory-reared from two collections of adults: California, Imperial County, Mountain Springs, 2,300', III-27-1979, K. W. Brown. Mexico, Baja California Norte, Arroyo Catavina, IV-2-1976. J. T. Doyen and P. A. Rude [J. Doyen Lot No. 76D1.1].

***Microschatia cedrosensis*, new species**

(Fig. 31)

Black beetles with coarsely, confluent punctate pronotum and strongly costate elytra.

Holotype male.—Frons set with coarse, setiferous punctures, nearly contiguous between eyes, becoming sparser, somewhat irregular anteriorly and then finer and subcontiguous around epistomal margin. Epistoma shallowly, arcuately emarginate anteriorly, scarcely indented at epistomal sutures. Labrum missing. Eye with barely noticeable prominence at apex of dorsal lobe; constriction almost half width of dorsal lobe. Antennal length about one and one-half times head width; segments four to nine distinctly longer than wide; ten trapezoidal, asymmetrical, slightly wider than long; eleven strongly asymmetrical; all segments set with moderately dense, coarse black setae, eleven with setae only on inner angle. Mentum broadly, shallowly emarginate with shallow median notch. Ligula missing. Postgenal process obtuse with very broadly rounded apex. Gular pedestal shallowly, arcuately emarginate.

Pronotum widest slightly before middle, about three-fourths as wide across anterior angles as basal; anterior angles acute with rounded apex; posterior angles nearly right angled, slightly exerted, not prolonged posteriorly; lateral margins scarcely explanate; posterior margin biconvex, with middle part almost twice width of lateral parts. Disk set with very coarse, deep, setiferous punctures, confluent laterally, becoming punctatorugose near margins and with irregular impunctate regions centrally; setae black, subspinose, decumbent. Hypomeron sparsely, coarsely punctate, more densely so near lateral carina. Prosternum tuberculopunctate anteriorly and laterally, becoming coarsely, confluent punctate on process. Prosternal process narrowly rounded.

Elytral base slightly wider than thoracic base; disk with sutural and four lateral polished, rounded costae; the two medial and the lateral-most costae reaching elytral



Fig. 31. *Microschatia cedrosensis* Brown and Doyen.

base; third costa ending at about level of metacoxae; intercostal spaces irregularly tuberculate or tuberculorugose, shagreened. Epipleural carina fine, distinct from humerus to elytral apex; epipleuron narrowing a little more abruptly near humerus, then gradually to apex. Legs as in *rockefelleri*.

Measurements.—Pronotal length 4.9 mm; greatest pronotal width 5.5 mm; elytral length 11.4 mm; greatest elytral width 7.7 mm.

Holotype male.—California Academy of Sciences, San Francisco.

Type locality.—Mexico, Baja California Sur, NE end Cedros Island, II-27-1952, J. P. Figg-Hoblyn.

Diagnosis.—*Microschatia cedrosensis* is similar to *costulata* Brown and Doyen but has the pronotal disk very coarsely, confluent punctate (much more finely, discretely punctate in *costulata*). In *cedrosensis* the elytral costae are all subequal in thickness and contour; in *costulata* the two medial costae are flattened and much thicker than the lateral two, which are acutely rounded.

Individuals of *M. championi* from coastal areas (San Quintin, Guerrero Negro) have coarsely punctate pronota, but have punctatorugose elytra without trace of costae.

Distribution and material examined.—Known only from the holotype.

***Microschatia costulata*, new species**

(Fig. 32)

Brownish black or black beetles with discretely punctate pronotum and strongly costate elytra.

Female.—Frons and epistoma set with coarse, setiferous punctures, denser and finer on lateral epistomal margins and with few irregular impunctate areas on frons. Epistoma very shallowly (almost truncate) to shallowly emarginate, scarcely indented at lateral epistomal sutures. Eye with moderate prominence at apex of dorsal lobe; constriction about half width of dorsal lobe. Antennal length about one and one-third times head width; segments four to seven subquadrate, eight to ten wider than long; ten asymmetrical; eleven strongly asymmetrical; all segments set with moderately dense, coarse black setae, eleven with setae only on outer angle. Mentum broadly emarginate with median notch very shallow. Ligula almost twice as broad as notch, exposed. Postgenal process very obtuse with very broadly rounded apex. Gular pedestal shallowly, arcuately emarginate.

Pronotum widest at middle; about three-fourths as wide across anterior angles as basal; anterior angles acute with briefly rounded apex; posterior angles obtuse, neither exerted nor produced posterad; lateral margins thick, narrowly explanate; posterior margin biconvex with middle part almost twice width of lateral parts. Disk set with punctures as on frons, becoming rugulose on explanate part of lateral margins. Hypomeron and prosternum as in *cedrosensis*.

Elytral base slightly wider than or subequal to thoracic base; disk with sutural and four lateral costae; sutural and next two costae very broad, flattened, smooth and polished; two lateral costae narrow, subcarinate, crenulate; two medial intercostal spaces punctatorugose, sometimes with a few tubercles; three lateral interspaces tuberculorugose and with few anastomosing cross-carinae. Epipleural carina fine, continuous from humerus to elytral apex, but irregularly crenulate, interrupted; epipleuron narrowing a little more abruptly near humerus, then gradually to apex. Legs as in *rockefelleri*.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 4.1 to 4.9 mm; greatest pronotal width 5.6 to 7.1 mm; elytral length 9.1 to 12.2 mm; greatest elytral width 6.1 to 8.3 mm.



Fig. 32. *Microschatia costalata* Brown and Doyen.

Holotype female (United States National Museum).—California, San Diego, Coll. Chittenden. One male and one female paratype from Mexico, Baja California Norte, San Quintin, V-9-1938, H. A. Brandt. The holotype and both paratypes appear to have been collected dead. The holotype (figured) is missing some tarsomeres and the apical two segments of each antenna and bears a hole in the left elytron and one in the base of the abdomen. These specimens are dark reddish black.

Diagnosis.—*Microschatia costulata* and *M. cedrosensis* appear to be sister species. The characters which differentiate them are detailed under the latter.

Distribution.—San Diego, California south to Bahia de San Quintin, Baja California Norte. Nothing is known of the habitat of this rare species. Most collection localities are coastal.

Additional material examined.—Baja California Norte, San Quintin, V-9-1938 (1 fragment); Santa Ynez, V-1983 (1).

Microschatia inaequalis LeConte
(Fig. 33)

Microschatia inaequalis LeConte, 1851:129.

Microschatia puncticollis LeConte, 1851:129.

Pycnonotida inaequalis Casey, 1912:92.

Pycnonotida puncticollis Casey, 1912:93.

Pycnonotida laxicollis Casey, 1912:91. NEW SYNONYMY.

Pycnonotida diversa Casey, 1912:92. NEW SYNONYMY.

Pycnonotida araneoides Casey, 1912:92. NEW SYNONYMY.

Pycnonotida impar Casey, 1912:92. NEW SYNONYMY.

Black or blackish brown beetles, occasionally with narrow, bluish white body margins; pronotum punctatorugose or tuberculorugose; elytra very coarsely rugose.

Female.—Frons and epistoma punctatorugose; depressions with sparse, coarse, brownish-black, decumbent setae. Epistoma moderately, arcuately emarginate anteriorly, scarcely indented at epistomal sutures. Eye with slightest prominence anterad of apex of dorsal lobe; constriction about half width of dorsal lobe.

Antennal length about one and one-third times head width; segments four to seven longer than broad; eight to ten trapezoidal, noticeably asymmetrical; eight subquadrate, nine and ten wider than long; eleven strongly asymmetrical; all segments set with moderately dense, coarse, black setae, eleven with setae only on inner angle. Mentum broadly, shallowly emarginate with very shallow median notch. Ligula about one and one-half times broader than notch, very small but exposed. Postgenal process obtuse; apex rounded to broadly rounded. Gular pedestal slightly emarginate.

Pronotum widest at about middle, about three-fourths as wide across anterior angles as basal; anterior angles acute to nearly right angled, with rounded apex; posterior angles strongly obtuse, very narrowly rounded, neither exerted or produced posterad; lateral margins crenulate, narrowly to moderately explanate, reflexed upward near basal corners, sometimes with narrow zone of faint, bluish white, flocculent material (probably wax); posterior margin biangulate with middle part about one and one-half times width of lateral parts. Disk finely tuberculorugose anteriorly, usually becoming punctatorugose posteriorly and along lateral margins; depressions set with short, decumbent setae; hypomeron tuberculopunctate or tuberculorugose; prosternum much more coarsely tuberculopunctate, becoming punctatorugose on process. Prosternal process broadly rounded.

Elytral base wider than or occasionally subequal to thoracic base, with humeral margin of epipleuron raised, forming distinct vertical ridge; disk very coarsely, irregularly rugose, often with overlay of fine tubercles, especially laterally; rugae sometimes tending to form one or more very convoluted, irregular longitudinal ridges; sutural area usually relatively smoother than remainder of elytra; lateral margin just above epipleural carina sometimes with narrow zone of faint, bluish white, flocculent material (probably wax). Epipleural carina crenulate, interrupted by rugae, but distinct from humerus to elytral apex; epipleuron punctatorugulose anteriorly, becoming rugulose posteriorly; gradually narrowing from base to apex. Abdominal sternites densely set with moderately coarse, setiferous punctures to asperately punctatorugose. Femora densely, asperately punctate to finely tuberculopunctate; setae coarse, black, declined. Middle and hind tibia asperately or tuberculosetose; setae finely to mod-

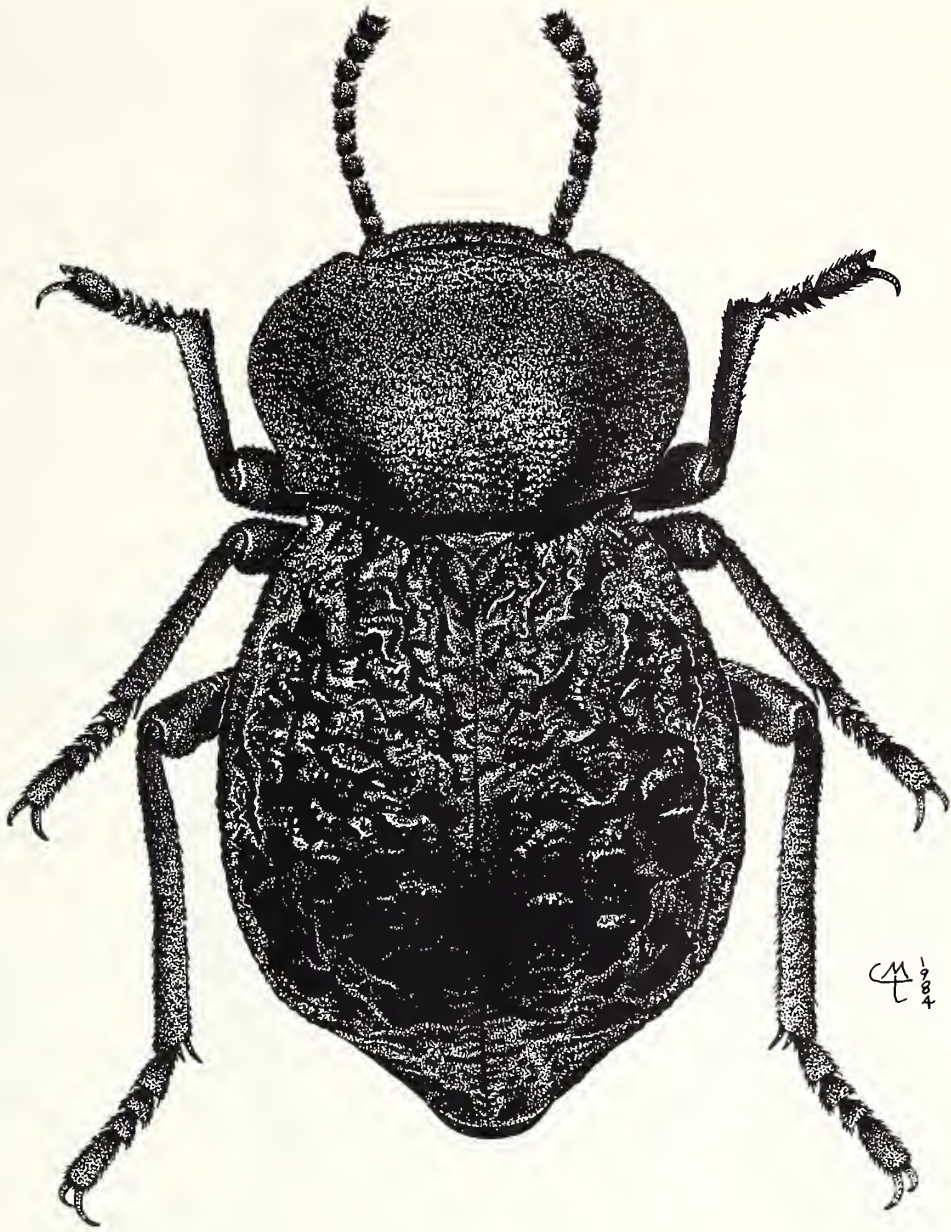


Fig. 33. *Microschatia inaequalis* LeConte.

erately coarsely spinose; anterior tibia tuberculose with coarse, blunt spines ventrally, finer sharp spinose setae dorsally.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 3.5 to 5.4 mm; greatest pronotal width 5.3 to 8.1 mm; elytral length 7.2 to 12.6 mm; greatest elytral width 5.5 to 8.9 mm.

Holotype (sex not determined).—Museum of Comparative Zoology, Harvard University.

Type localities.—Of *inaequalis*, San Diego; of *puncticollis*, “Warners” [Warner Springs]; of *diversa*, “vicinity of San Diego” (all San Diego County, California); of *laxicollis*, *araneoides*, and *impar*, southern California.

Diagnosis.—The tuberculopunctate pronotal disk and tuberculate hypomeron distinguish *M. inaequalis* from all other *Microschatia*. It is most similar to very coarsely sculpted individuals of *championi*; in those specimens, however, the pronotal disk is coarsely, closely punctate or punctatorugose and the hypomeron is coarsely punctate, never tuberculate. In addition, the elytral rugosity of *inaequalis* is almost always

overlain by fine tubercles. In *championi* tubercles are never present. *Microschatia polita* Horn is similar to *inaequalis* in body shape, but it is easily distinguished by its smooth, highly polished integument (coarsely punctate, punctatorugose or tuberculogose and usually dull in *inaequalis*).

Variation.—Two individuals labeled Anza Borrego Desert have the pronotal disk coarsely, confluent punctate, with only faint indications of tubercles near the anterior margin. The elytra of these specimens are much less rugose than typically, and are somewhat polished and shining, without setae and with only a few very fine tubercles anterolaterally. These correspond to *puncticollis* LeConte. However, two specimens from Borrego Springs have the pronotal disk tuberculopunctate and the elytra strongly rugose, dull and overlain by tubercles, as usual. A few individuals have the dorsal setae reddish brown rather than black, but do not differ otherwise. The bluish white (wax?) deposits on the lateral margins of the elytra and occasionally the pronotum range from very evident to extremely faint, and are absent from many individuals. None of the features described above shows any obvious geographic patterning. All the species described by Casey (1912) clearly lie within the normal range of variation of *inaequalis*, and are here placed in synonymy without further explanation.

Distribution.—Northern Baja California Norte and California south of the Los Angeles Basin, in a variety of arid and semiarid habitats including coastal scrub, sparse savannah woodland, chaparral, and Sonoran Desert.

Material examined.—California. Los Angeles County, La Mirada, I-7-1976 (1); Los Angeles, IV-9-1955 (1); (no date) (1). Orange County, Costa Mesa, VII-11-1957 (1); Fullerton, IV-30-1952 (1); Laguna Beach, III-31-1962 (1); IV-15-1949 (1); VI-27-1932 (1); Newport Beach, IV-28-1962 (17); Sand Canyon, II-26-1972 (1); lower Trabuco Canyon, IV-7-1962 (1). Riverside County, Box Springs Mountains, II-9-1964 (1); III-1-1965 (1); IV-18-1964 (3); Box Springs Canyon, III-1964 (1); Gavilan Hills, II-20-1965 (1); the Gavilan, IV-18-1937 (1); Grand Terrace, IV-12-1964 (3); Riverside, I-10 to VII-21 (various years) (29). San Bernardino County, Victorville, IV-14-1962 (1). San Diego County, Alvarado, V-19-1949 (1); Anza Borrego Desert, III-22-1978 (2); Borrego Springs, IV-15-1978 (1); Daylight, II-22-1956 (1); Flinn Springs County Park, IV-28-1962 (1); Lakeside [15 mi E San Diego], XII-22-1910 (1); (no date) (1). La Jolla, IV-28-1969 (5); XII-20-1910 (2); La Mesa, III-2-1958 (1); III-23-1951 (1); Mission Valley, II-8-1934 (1); II-22-1934 (1); Otay, V-18-1943 (1); Ramona, III-7-1942 (1); San Diego, I-25/26-1888 (13); I-1909 (1); II-2-1899 (1); II-10-1888 (1); III-1899 (1); IV-21-1921 (1); I-26 (1); III-2 (1); III-10 (24); VIII-13 (1); (no date) (24). Mexico. Baja California Norte, Cantamar, 5 km S, X-22-1981 (1); Ensenada, I-5-1925 (1); IV-17-1973 (1); (no date) (11); Punta Banda, II-23-1935 (2); Rosarito Beach, XI-12-1956 (2); 7.5 mi S Santo Tomas (2); 10 mi N San Vicente, III-25-1973 (1); Todos Santos Island, V-25-1923 (1).

Microschatia polita Horn
(Fig. 34)

Microschatia polita Horn, 1893:141.

Pycnonotida polita, Casey, 1912:93.

Polished, shiny black beetle with finely punctate dorsum.

Holotype female.—Frons and epistoma finely shagreened, sparsely, shallowly punc-



Fig. 34. *Microschatia polita* Horn.

tate. Epistoma very shallowly emarginate anteriorly, scarcely indented at epistomal sutures. Eye partly concealed by pronotum, but constriction apparently about half width of dorsal lobe. Antenna about one and one-fourth times head width; segments four to seven longer than wide, eight subquadrate, nine and ten wider than long; eleven strongly asymmetrical; setation as in *inaequalis*. Mentum very shallowly emarginate with shallow median notch. Ligula almost twice as broad as notch, bidentate. Postgenal process obtuse, apex broadly rounded. Gular pedestal moderately emarginate.

Pronotum widest at about middle, about four-fifths as wide across anterior angles as basal; anterior angles acute with rounded apex; posterior angles obtuse, neither produced nor exerted; lateral margins narrowly explanate, crenulate; posterior margin biangulate with middle part about one and three-fourths times as wide as lateral parts. Disk set with very fine, sparse, minutely setigerous punctures; polished, shining centrally, shagreened near anterior margin, shagreened and rugulose near lateral margins. Hypomeron punctate; prosternum tuberculopunctate, becoming punctatorugose on process; process narrowly rounded.

Elytral base slightly wider than thoracic base with humeral margin of epipleuron

minutely everted; disk smooth with weak undulations; wrinkled along suture; shiny, with fine sparse setigerous punctures centrally, becoming finely, sparsely tuberculate laterally. Epipleural carina sharp, distinct from humerus to apex. Epipleuron narrowing slightly more rapidly to hind coxa then gradually to elytral apex. Abdominal sternites shagreened with fine, sparse setigerous punctures. Legs as in *inaequalis*.

Measurements.—Pronotal length 4.2 mm; greatest pronotal width 5.9 mm; elytral length 10.7 mm; greatest elytral width 6.9 mm.

Holotype female.—Museum of Comparative Zoology, Harvard University.

Type locality.—Arizona.

Diagnosis.—Similar in body shape to *M. inaequalis*; *M. polita* is easily distinguished by its smooth, shiny, finely punctate dorsum.

Distribution.—Known only from the holotype.

***Microschattia planata* Doyen and Brown, new species**
(Fig. 35)

Weakly shining, black beetles with broadly explanate pronotum and smooth, finely punctate elytra. Tibia of fore and middle legs flattened, laterally carinate.

Female.—Frons and epistoma with fine, subcontiguous, minutely setigerous punctures, closer laterally, with small, irregular impunctate areas medially. Epistoma very shallowly emarginate, almost truncate; scarcely indented at lateral sutures. Labrum very shallowly emarginate or subtruncate anteriorly. Eye moderately narrow, with small but distinct prominence at apex of dorsal lobe; constriction about two-thirds width of dorsal lobe. Antennal length about one and one-fifth times head width; segments four to seven longer than broad; eight subquadrate; nine and ten asymmetrical, wider than long; segments two to ten set with moderately dense, coarse, black setae; eleven with apical margin ringed with setae, longest on inner angle. Mentum broadly, moderately deeply emarginate with moderate median notch. Ligula about one and one-half times as broad as notch, exposed. Postgenal process slightly obtuse, broadly rounded. Gular pedestal shallowly emarginate.

Pronotum widest at about middle, about four-fifths as wide across anterior angles as basal; anterior angles obtuse, broadly rounded; posterior angles nearly right angled, neither produced nor exerted; lateral margins somewhat thickened, strongly explanate; posterior margin biangulate, with middle part about three times as wide as lateral parts. Disk with moderate paramedian gibbosities and very shallow, broad medial depression in posterior sixth; central area set with minutely setigerous punctures slightly larger than those on head, becoming coarser laterally and then deeply, reticulately punctate on explanate part of margins; becoming finer, sparser posteromedially. Hypomeron smooth except rugulose near lateral carina; sometimes with few fine, deep punctures near prosternum. Prosternum deeply tuberculopunctate, becoming reticulately punctate on process. Prosternal process slightly declivous behind coxa, with acutely rounded or subsaggitate apex.

Elytral base slightly narrower than thoracic base, humeral margin of epipleuron weakly raised; anterior margin with small gibbosities opposing those on pronotum; disk slightly undulating, smooth, weakly shining, with sparse punctures slightly smaller to slightly larger than those on pronotum; becoming more coarsely punctate or punctatorugose laterally. Epipleural carina fine, distinct from humerus to elytral apex;

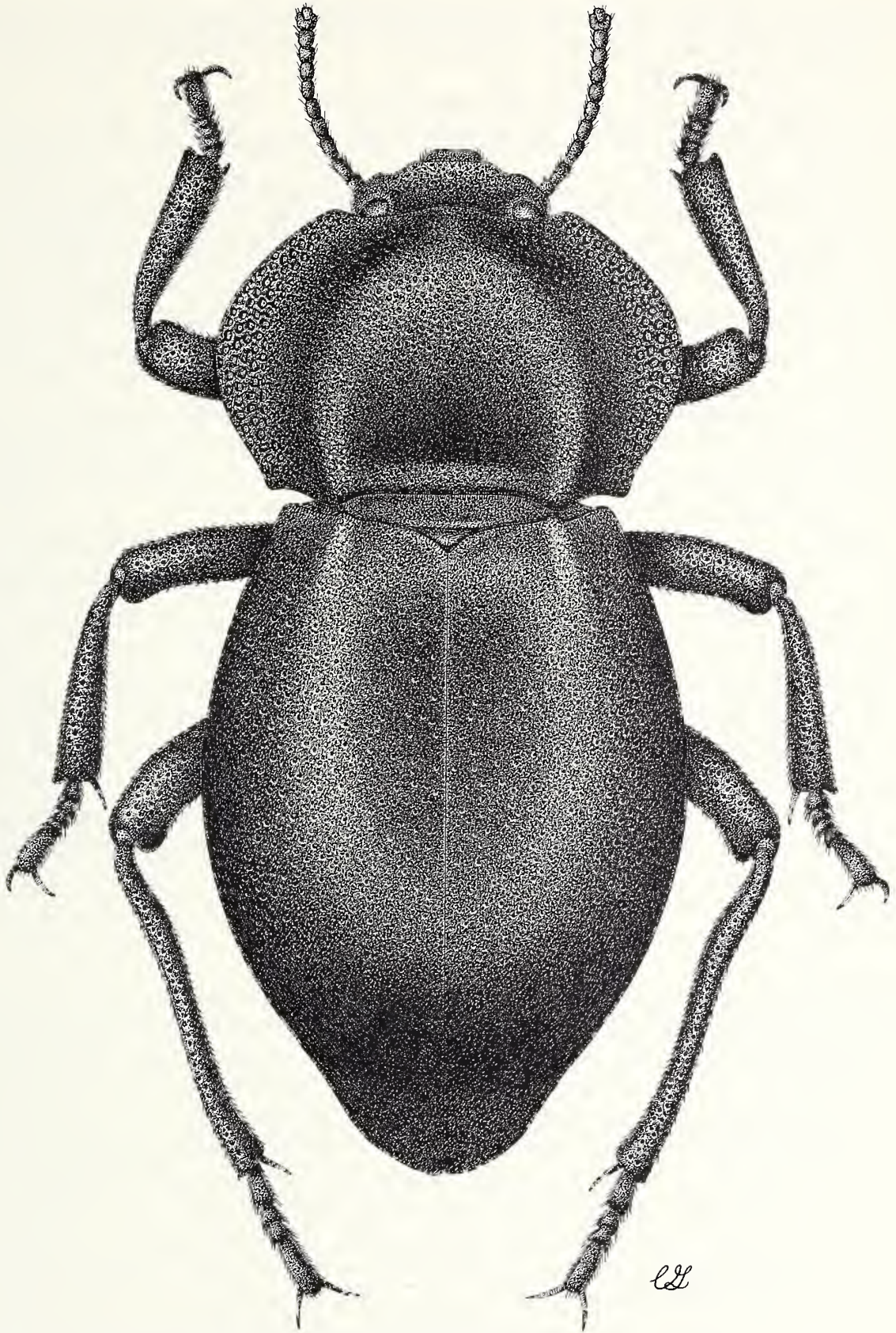


Fig. 35. *Microschatia planata* Doyen and Brown.

epipleuron sculpted like disk, narrowing more rapidly to metacoxa, then gradually to elytral apex. Abdominal sternites smooth, shining; surface finely punctate on first four, more coarsely so on fifth; sternites three and four with irregular impunctate medial areas. Femora densely, sometimes subcontiguously set with deep, setigerous

punctures; setae short, black. Anterior and middle tibiae flattened with subcarinate outer margin; anterior tibia with anterior spur much larger than posterior. Posterior tibia weakly to moderately arcuate.

Male.—Differs as indicated in generic description.

Measurements.—Pronotal length 5.9 to 7.6 mm; greatest pronotal width 8.8 to 11.7 mm; elytral length 8.0 to 12.1 mm; greatest elytral width 9.2 to 12.0 mm.

Holotype female [CAS] and 88 paratypes from Mexico, Baja California Norte, Miller's Landing, IV-6-1976, J. Doyen, on sand dunes at night; 21 paratypes, same locality, III-29-1973. Miller's Landing is approximately 50 km ESE of Punta Prieta; 23 paratypes, Baja California Sur, 9 km N Guerrero Negro, sand dunes, IX-8-1977, E. Fisher, R. Westcott; 15 paratypes same locality, III-23/24-1987, J. Doyen, S. Stockwell.

Diagnosis.—Its flattened fore and middle tibiae and curved hind tibia distinguish *planata* from all other *Microschatia* (tibiae round; straight in others). The broad, explanate pronotum and overall flattened appearance are also distinctive. This is the largest species of *Microschatia*.

Distribution and habitat.—Endemic to the Vizcaino region of Baja California, where it inhabits sandy substrates, especially aeolian sand dunes. The beetles occur in very large numbers in some years. They are diurnally active in cool, overcast situations, otherwise, nocturnal. The modifications of the legs appear to be adaptations for digging into the sand, in which the beetles shelter during most days.

Additional material examined.—Mexico, Baja California Norte, 1.8 km SE Miller's Landing, VI-27/28-1973 (2). Baja California Sur, Guerrero Negro, 2 mi N, VI-25/26-1977 (2); 5 km N, VIII-25-1975 (2); 9 mi N, III-23/24-87 (12); 11.3 km N, IV-10/11-1976 (12); 15 mi N, III-23-87 (2); 9 km N, IX-8-77 (5); 7 mi W, IV-7-1976 (1); 7 mi SE, IV-8-1976 (1); 24 km SE, IV-11-1976 (1); 47 km SE, I-15/16-1974 (1); 66 rd km W Vizcaino, III-24/25-1980 (2).

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Appendix 1. Character list. Primitive character states are coded a; derived states, b. For discussion see text.

-
0. Labrum shape— anterior border (Fig. 1)
 - a. Shallowly emarginate (0)
 - b. Deeply emarginate (1)
 1. Lateral epistomal margin (Fig. 2)
 - a. Straight or weakly indented (0)
 - b. Deeply, angulately indented (1)
 2. Anterior epistomal margin (Fig. 2)
 - a. Shallowly concave (0)
 - b. Deeply concave (1)
 3. Eye shape (Fig. 3)
 - a. Very narrow, strongly constricted by epistomal canthus (0)
 - b. Moderately narrow, weakly constricted (1)
 4. Mentum, anterior margin (Fig. 4)
 - a. Shallowly, broadly notched (0)
 - b. Deeply, narrowly notched (1)
 5. Ligula (Fig. 4)
 - a. Exposed, relatively large (0)
 - b. Concealed, relatively small (1)
 6. Antennal length
 - a. Short, less than 1.1 (female) or 1.45 (male) width of head (0)
 - b. Longer, more than 1.2 (female) or 1.5 (male) width of head (1)
 7. Antennal segment 10, shape (Fig. 5)
 - a. Subquadrate (0)
 - b. Wider than long (1)
 8. Antennal segment 10, sensory tomentum (Fig. 5)
 - a. Tomentose sensory patches subequal (0)
 - b. Outer patch much larger than inner (1)
 9. Pronotum, shape of disk (Fig. 6)
 - a. Much narrower at base than at widest point (0)
 - b. Slightly narrower at base or subequal to widest point (1)
 10. Pronotum, posterior corners (Fig. 6)
 - a. Obtuse or right angled (0)
 - b. Acute (1)
 11. Pronotum, posterior border (Fig. 6)
 - a. Arcuate (0)
 - b. Bisinuate or biangulate (1)
 12. Pronotum, posterior gibbae
 - a. Very weak or absent (0)
 - b. Strong (1)
 13. Relative width of elytral base (Fig. 6)
 - a. Equal to or wider than base of thorax (0)
 - b. Narrower than base of thorax (1)
 14. Hypomerion, sculpture
 - a. Smooth (0)
 - b. Punctate or tuberculate (1)
 15. Prosternal process, shape (Fig. 7)
 - a. Broadly rounded or truncate (0)
 - b. Narrowly rounded to sagittate (1)
-

Appendix 1. Continued.

-
16. Elytral shape (Fig. 6)
 - a. Much narrower at base than at widest point (0)
 - b. Slightly narrower at base (1)
 17. Elytral sculpture (I)
 - a. Smooth, punctate (0) (Figs. 12, 18)
 - b. Rugose or reticulate (1) (Figs. 13, 14, 15, 21)
 18. Elytral sculpture (II)
 - a. Non-costate (0) (Figs. 12, 13, 18, 22, 23)
 - b. Costate (1) (Figs. 14, 16, 17, 19, 20)
 19. Elytra, humeral angle (Fig. 8)
 - a. Strong, projecting forward (0)
 - b. Weak, not projecting forward (1)
 20. Epipleuron, basal width (Fig. 8)
 - a. Moderately wide (0)
 - b. Very wide (1)
 21. Epipleuron, shape (Fig. 8)
 - a. Narrowed evenly from humerus to elytral apex (0)
 - b. Narrowed more rapidly near humerus, then evenly to apex (1)
 22. Epipleural carina (Fig. 8)
 - a. Distinct from humerus to elytral apex (0)
 - b. Obsolete or absent in posterior half (1)
 23. Body surface
 - a. Clean (0)
 - b. With earthen coating in certain regions (1)
 24. Body setation
 - a. All setae simple, hairlike (0)
 - b. Some setae flattened, scale-like (1)
 25. Thoracic/elytral setation
 - a. Margined by dense scaling (0)
 - b. Setae sparsely, evenly distributed (1)
 26. Setation on legs
 - a. Black (0)
 - b. Whitish or yellowish (1)
 27. Tarsomere configuration
 - a. Slender (0)
 - b. Thickened (1)
 28. Antennal segment thickness
 - a. Slender (0)
 - b. Thickened, \pm moniliform (1)
 29. Mentum size (Fig. 4)
 - a. Smaller than buccal opening; not contacting postgenae (0)
 - b. Filling buccal opening; contacting postgenae except at corners (1)
 30. Prosternal process shape
 - a. Declivous (0)
 - b. Porrect (1)
 31. Configuration of antennal apex
 - a. Segment 11 about half as large as 10; segment 10 not emarginate (0)
 - b. Segment 11 about one-fourth size of 10; 10 deeply emarginate (1)
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